

THE IRON AGE

DUCTION -- MANAGEMENT

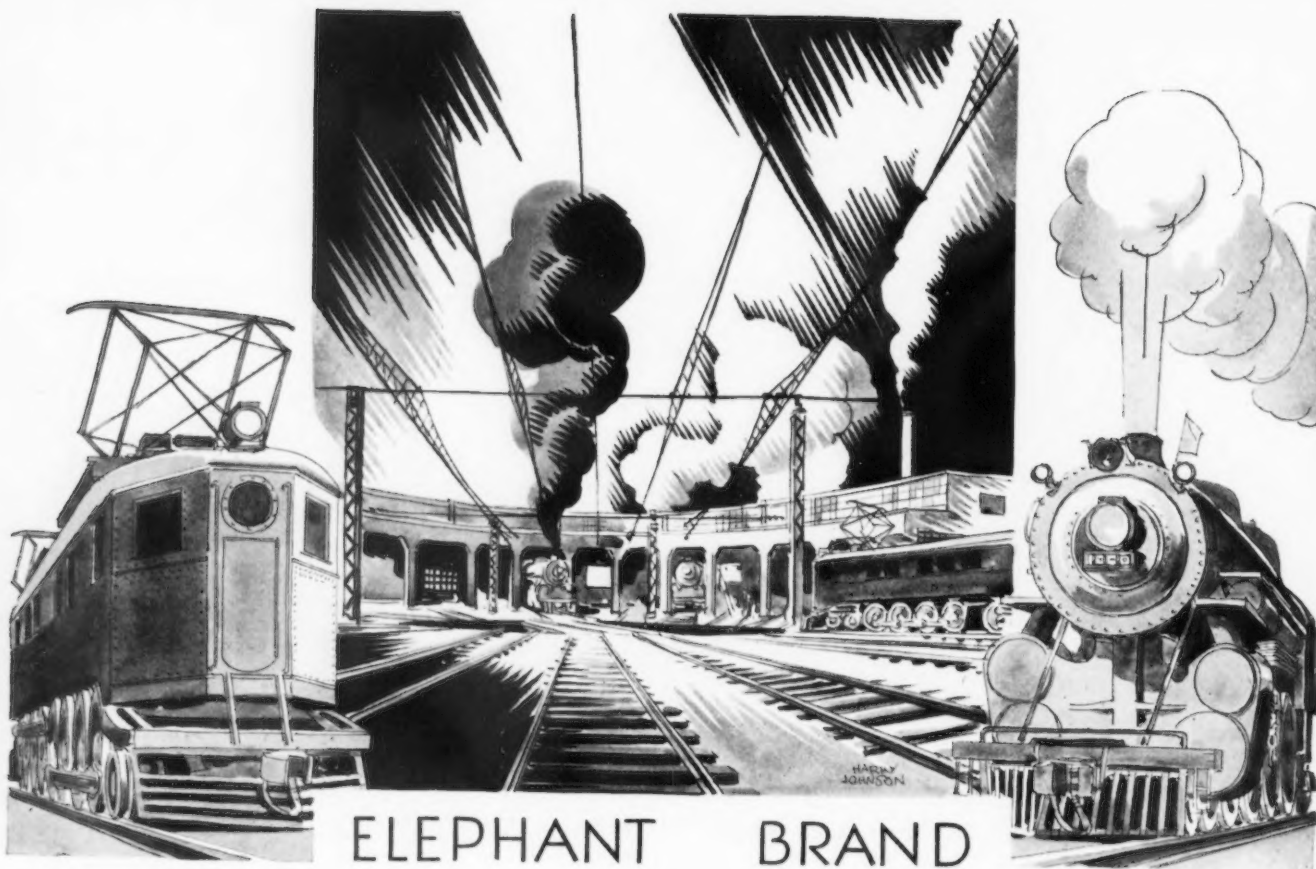
MARCH 1, 1934

PROCESSES -- NEW

A BEST SELLER!



Col. W. T. Chevalier said in January, when he addressed the Eastern Industrial Advertisers, "Every industry has suffered an enormous turnover in personnel." He wasn't exaggerating a bit. A mailing list two years old contains enormous deadwood. ★ There is only one way for a publication to keep circulation alive and that is to allow the subscriptions to face the expiration date once a year, and drop those subscriptions that do not renew. ★ None of The Iron Age circulation runs for more than a year without facing the expiration date. Then the readers decide again whether they want to continue reading it. 73.2% say "yes", and they say it with money—\$6 per year. No other weekly or monthly publication in this industry does as well. ★ During 1933 The Iron Age sold more subscriptions than any other metal-working publication, and at a higher price. That shows current reader interest in The Iron Age and how readers recognize value. During the last six months of 1933 The Iron Age sold 5,768 subscriptions; publication B sold 4,082; C sold 2,852; D sold 2,552; and so on down the list. ★ This is live paid circulation which assures reader interest as of today. It clearly indicates that The Iron Age is the best seller in the metal-working industry in these times of economy and personnel turnover. Special rates for long term subscriptions are a convenience to a publisher in maintaining circulation volume, but they deprive advertisers of a yearly check-up on reader-interest.



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For many years the railroads have been using large quantities of Elephant Brand Phosphor Bronze for journal bearing and other purposes. Its hardness, durability and anti-friction qualities minimize wear on journals and reduce heating tendencies—insuring longer service under the most severe conditions.

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▲▲▲ THE IRON AGE ▲▲▲

ESTABLISHED 1855

MARCH 1, 1934

Vol. 133, No. 9

Your Code Is What You Make It

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THIS week and next should be memorable ones in American industrial history. They will probably determine whether or not industry is capable of self-government.

Following nine months of mental and physical travail which gave birth to so many codes, we are asked to critically examine the fruits of these labors. To this end are the current NRA conferences in Washington.

At the start, many of us doubted and opposed the idea of codification because we felt that it was a step toward regimentation and bureaucratic regulation. That it was putting Government into business and to stay.

It is obvious now, in the light of events, that the purpose of NRA is to put government into business but not Government. That little difference between a small and a capital letter is a mighty big one.

Business had been a game that was played without rules except those of the written statutes of law. And unfortunately, no law prohibited, in the struggle of depression, the price throat cutting that was bleeding whole industries to death. A stop *had* to be put to it.

The initiative had to come from Government. Industry was not so organized as to be able to take it. Hence the NRA. At first, it looked like the establishment of an industrial dictatorship or at best the setting up of a powerful bureaucracy.

There is this vital distinction, however, between the characteristics of General Johnson's organization and a bureaucracy. The latter never gives up any powers that it gets and it continually reaches for more. The NRA is bending every effort to fit industry to do for itself what is now being done for it.

This is rank bureaucratic heresy, of course, and already some shocked and astonished bureaucrats not in the NRA may be seen reaching out in the effort to obtain control of that which General Johnson is anxious to put back where it belongs.

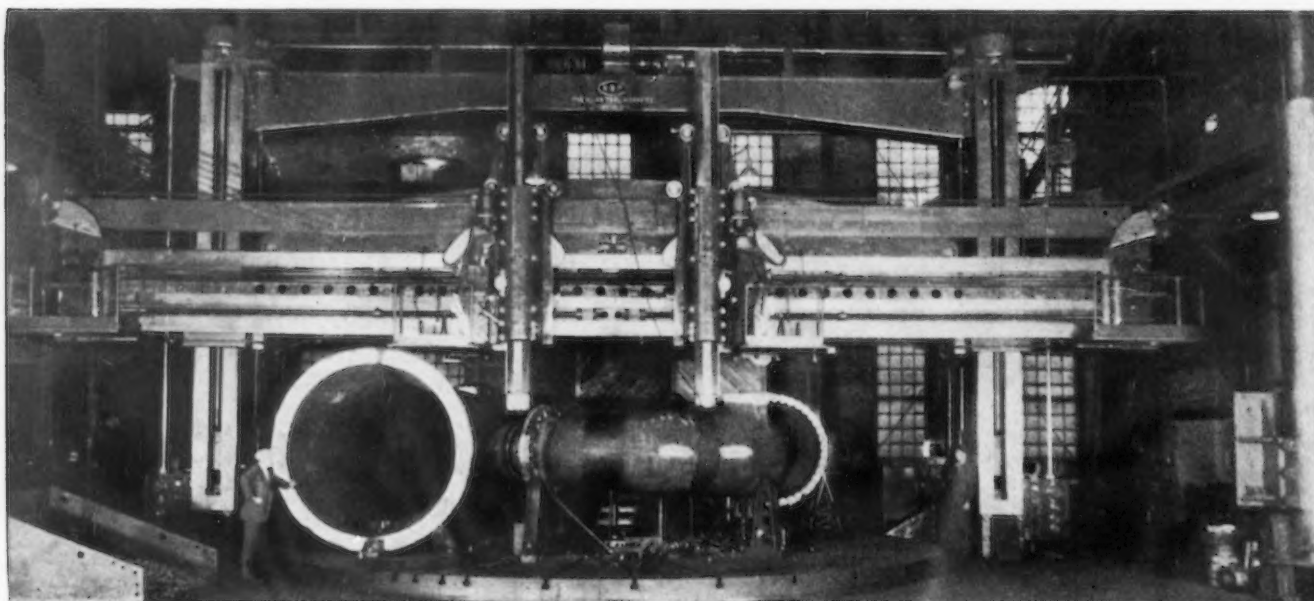
We hope and believe that the great gathering in Washington of code spokesmen chosen by industry and business as their representatives will go far to block these attempted usurpations and to further the purpose of NRA to make industry self-governing to the greatest possible degree and as soon as possible.

There are naturally rough edges in our various codes. But now we are invited to disclose them and have the friction points smoothed away. That is a challenge to constructive cooperation that no fair-minded man can refuse to accept.

Your code will be what you make it.

J. W. Van Duzee

Fig. 1—This boring mill, installed at the Milwaukee plant of the Allis-Chalmers Mfg. Co., has a swing of 40 ft. 4 in. The entire bed and drive mechanism are under the floor and are reached by passageways provided for the purpose.



Giant Boring Mill Used on Large Turbine and Generator Parts

By M. M. McCALL

AS engineering requirements have continued to call for larger and still larger machines, it is interesting to note some results of the builders' endeavors to produce tools of the necessary dimensions.

With every increase in size, close cooperation between the foundry, machine shop and engineering department is necessary to design the large castings so that they can be machined on existing shop equipment. The designer is also forced to keep the dimensions of these large parts within proper limits to facilitate shipping.

Increase in size has been more pronounced in connection with vertical boring and turning mills than with any other machine tools. This has been brought about principally by the development of large turbines and electric generators. Several large machines of this type with swings between 30 and 36 ft. have been built by Betts, Sellers and Niles, but the largest built in this country is the one furnished by the Niles Tool Works Co. for the Milwaukee shop of the Allis-Chalmers Mfg. Co. This machine has a swing of 40 ft. 4 in. and a maxi-

mum height of 16 ft. 3 in. under the tool holders. It weighs 1,040,000 lb. and required over 20 railroad cars for shipment. The foundation contains 2300 cu. ft. of concrete.

Because of the increase in the size of many of its products, the Allis-Chalmers Mfg. Co. found the purchase of a boring and turning mill of this enormous capacity to be necessary to economically perform the operations on the large units.

Fig. 1, which shows the machine installed, gives a general idea of the parts of the machine above the floor line. The floor is built over the entire bed and drive mechanism. Electrically lighted passageways reached by a trap-door and ladder at the rear are provided to give access to the drive motor, gear box and driving mechanism under the bed. Similar passageways reached from a trap-door and ladder in front of the table, give access to the spindle bush, adjustable table track and the lubricating pumps

and tank. These passageways are painted white and kept very clean.

Machine Driven by 170-Hp. Motor

The machine is driven by a 170 hp. Allis-Chalmers 6 to 1 variable-speed motor. On the power line and in series with the main drive motor is an Allis-Chalmers booster set which generates a variable voltage and gives the wide speed variation.

The motor drives the machine through a gear box located behind the table. All gearing in the box is of herringbone type and the speed change is obtained by shifting a jaw clutch between low and high gear. This is the only mechanical speed change necessary, because of the wide speed variation of the drive motor. The table speeds range from 0.12 to 0.72 r.p.m. with the low gear and from 0.66 to 4 r.p.m. with the high gear. At the front end of the gear box an oblique bevel pinion drives oblique bevel gears mounted on two angular driving shafts which turn in bearings bolted to the bottom of the bed. Bevel gears on the other end of these angular shafts drive the two vertical table pinion



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shafts, the centers of which are located diametrically opposite each other on the centerline of the table parallel to the face of the crossrail. To equalize the drive to the two table-driving pinions, both angular driving shafts are made in two lengths joined by Falk flexible couplings.

The table is 33 ft. 6 in. in diameter and is designed to support a load of 400,000 lb. It turns on two flat circular tracks on the bed, the outer track having an outside diameter of 24 ft. and a width of 10 in. The inner track, which is adjustable for taking up wear, has an outside diameter of 6 ft. 4 in. and a width of 8 in. The table spindle is 30 in. in diameter and 39 in. long. It turns in an adjustable split tapered bush.

Twelve Changes of Feed

Feed for the bars and saddles is taken from the drive mechanism by extending the main driving shaft forward from the drive gear box and then vertically to a long horizontal shaft. This shaft transmits the feed to the feed gear boxes attached to the outside surface of each housing near the floor. Feed boxes contain necessary sliding gears to give 12 changes of feed, and mechanism for reversing the direction of the feed. Feeds are thereby independent in amount and direction for each head on the cross rail. Vertical spline shafts transmit the feeds from the feed boxes to the ends of the crossrail and thence as crossfeed to the heads by the crossfeed screws in the crossrail, or vertical feed to the boring bars by means of spline shafts in the crossrail and racks on the bars. The boring bars are octagonal in section and 14 in. across flats. They have a travel of 10 ft. vertically or angularly. Each bar is swivelled for angular work by a 2 hp. motor mounted on the head.

At the rear on each end of the crossrail are 10-hp. constant-speed motors to furnish rapid power traverse to their respective rail heads and boring bars. The power traverse mechanism is interlocking with, and operates through, the feed mechanism to each head. Levers which are duplicated on the head and the end of the crossrail select feed or rapid traverse. Push buttons on each head and each end of the crossrail start, stop and reverse the rapid traverse motors.

A 35-hp. constant-speed motor is located on the top brace for elevating the crossrail to its proper position by means of four screws, two on each housing. The crossrail is clamped to the housings by electric clamps which require four 1-hp. motors, one on the inside and outside of each housing.

THE boring and turning mill here described is representative of some of the large machine tools called for by the development of large turbines and electric generators. This machine, installed at the Milwaukee plant of the Allis-Chalmers Mfg. Co., swings 40 ft. 4 in. and weighs more than 520 tons. In addition to general construction, Mr. McCall outlines the method of table speed control, and the making of the table, bed and other members in sections to facilitate machining and shipment.

The crossrail is stiffened vertically between the housings by a camber beam, the arch of which is 54 in. deep at the center.

The lubricating pumps are driven by a 2-hp. motor. One of them furnishes pressure lubrication for the table tracks and the other supplies oil to the drive and feed mechanism. All motors on the machine were made by the Allis-Chalmers company.

Speed Control Through Motor-Driven Rheostat

An interesting feature of the control of the table speeds is a motor driven rheostat, which in addition to giving suitable motor speeds also controls the shifting of the clutch from low to high gear and vice versa. With this mechanism it is possible to start and stop the table and select the proper table speed at any one of six push-button stations. These stations are located on each head, at each end of the crossrail, and on the side of each housing near the floor.

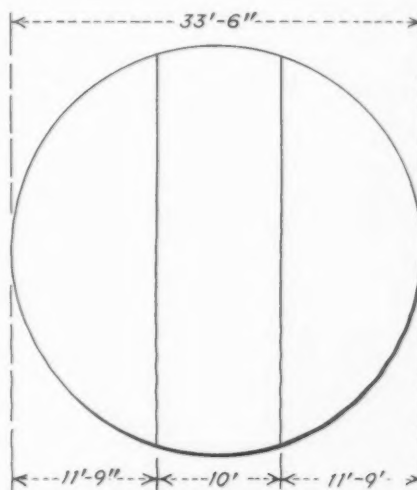


Fig. 2—Casting the table in three parts facilitated shipping. Only one pattern was required for the two outside sections.

In addition to the forward, reverse and stop buttons there are two other buttons, one marked "fast" and the other "slow." When the push button marked "fast" is held in with the motor running and the rheostat arm at the slow speed end of its travel, the rheostat driving motor is energized moving the rheostat arm and thereby increasing the speed of the main driving motor step by step until its highest speed is obtained. Further movement of the rheostat arm stops the main driving motor by dynamic braking. While dynamic braking is operating the rheostat driving motor is automatically stopped. When dynamic braking is completed the rheostat driving motor is again energized in the fast direction and the movement of the rheostat arm energizes the ½-hp. clutch-shifting motor in the proper direction and the clutch shifting operation from low to high gear is started. While the clutch shifting mechanism is in operation the rheostat driving motor is again automatically stopped until the operation is completed. If the clutch teeth happen to be opposite spaces on the mating piece the shifting will be completed by the motor, but if teeth happen to be opposite teeth they will contact on their faces and prevent further motion of the clutch. The shifting motor however will continue to the end of its cycle and the energy will be stored in a spring. When the clutch-shifting motor is stopped by a limit switch at the end of its cycle, the rheostat driving motor is again energized and the further movement of the rheostat arm causes the main drive motor to be jogged so that the clutch teeth will go into mesh if they had not already done so. The rheostat arm continuing in the fast direction again starts up the main drive motor at its lowest speed and further movement will increase the speed of the motor step by step through its entire range. A limit switch in contact with the clutch shifting lever will only permit high motor speeds when the clutch is in full mesh with either low or high gear.

All of the above operations are performed by simply holding in the "fast" push button, and by holding in the "slow" push button the reverse of these operations is obtained. At each push-button station is located a speed indicator which shows the speed of the table. When the operator, located at any one of the six push-button station, desires a certain table speed he first glances at the speed indicator. If the desired speed is slower than that shown by the indicator he presses the "slow" push button and if it is faster he presses the "fast" push button. In either case he simply holds the button

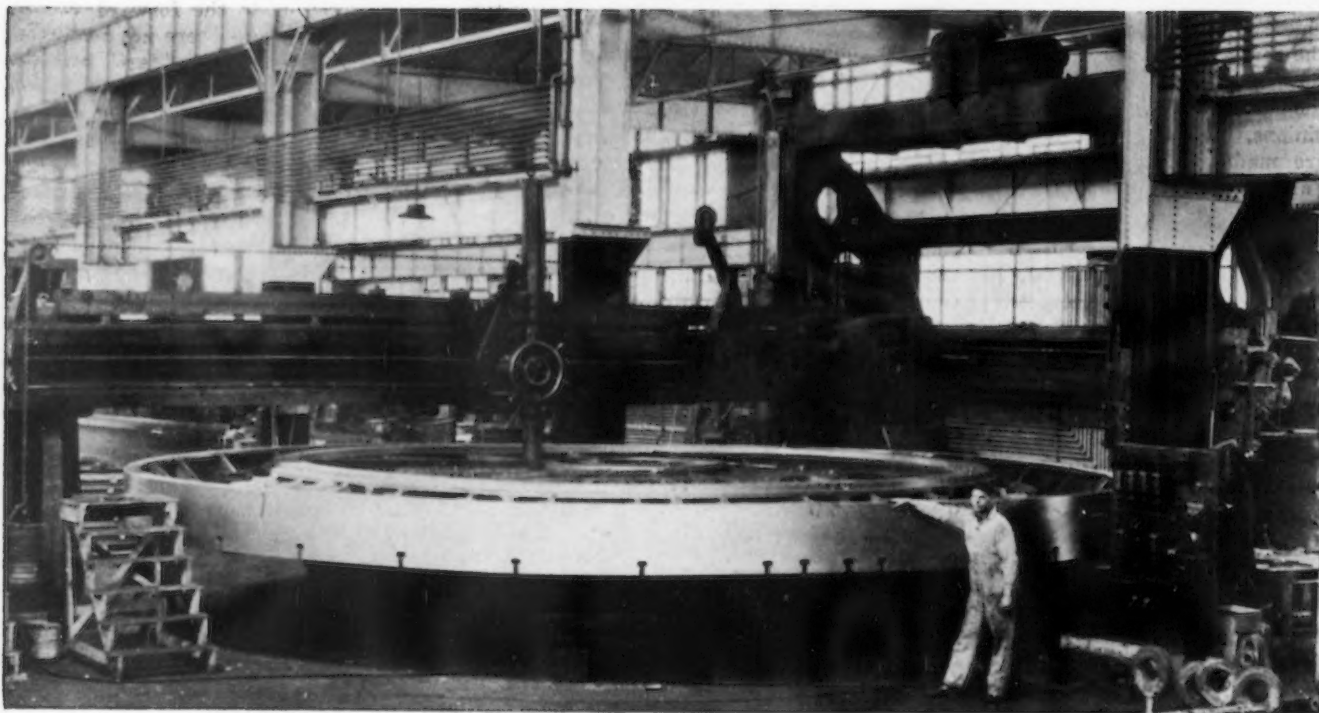


Fig. 3—A 20-34 ft. extension boring mill equipped with reach arm was used for machining the table.

until the indicator shows the speed.

Wires along the side of the right-hand housing with collectors on the crossrail, and wires along the crossrail with collectors on the heads, connect the control stations and furnish current for the various motors. The electrical control was designed by the Allis-Chalmers organization in conjunction with the Cutler-Hammer Mfg. Co.

Large Parts Made In Sections to Facilitate Machining and Shipping

It is interesting to note how some of the large parts were made to facilitate machining and shipping.

The table was cast in three parts as shown in Fig. 2. This not only made the parts of suitable size for shipping but required the use of only one pattern for the two outside sections.

The table with its three parts bolted

together was turned, bored, and faced on top and bottom on a Niles 20-34 ft. extension-type boring and turning mill. This machine has a normal swing of 20 ft. with the housing forward, which is increased to 34 ft. when the housings are moved to the rear. With the housings to the rear the utility of the two rail heads is limited to the larger diameters and an auxiliary head mounted on a reach arm perpendicular to the face of the crossrail is required for work on the smaller diameters. One end of this reach arm is fastened to the crossrail and the other end is supported on a post in front of the table. Feed to this head is obtained from the motion of the table. Fig. 3 shows the underside of the table being machined.

The table gear was a ring gear made up of four sections bolted together and fastened to the table. It had 247

teeth of $\frac{3}{4}$ diametral pitch and a face of 12 in. As the outside diameter was 27 ft. 5 in., it was necessary to use the 20-34 ft. extension mill for the turning operations. The teeth were cut on a Niles built Maag gear generator, having a maximum capacity for gears 40 ft. in diameter.

Bed and Housings Cast in Sections

The bed, which has a width of 45 ft. 4 in. and a depth of 28 ft. 8 in., was cast in four sections and joined as shown in Fig. 4. To turn the table tracks and bore the tapered hole for the spindle bush it was necessary to bolt the two center sections together and machine them on the 20-34 ft. extension mill. Note that the radius of 16 ft. 11 in. to the outermost corner is just under the full swing of 34 ft.

It was necessary to cast the housings in two sections as shown in Fig. 5

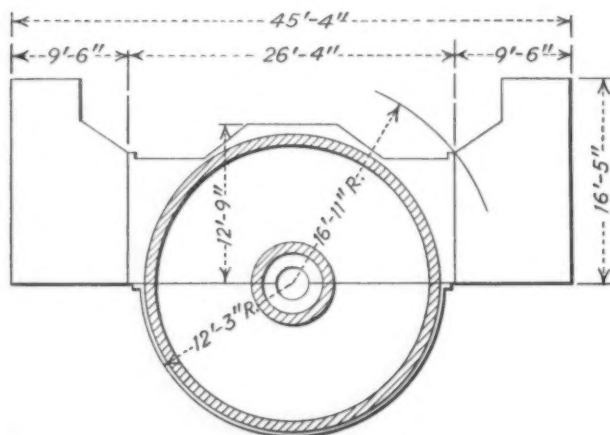
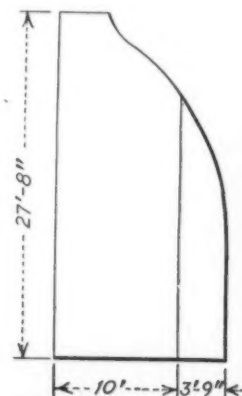


Fig. 4—The bed (at left) was cast in four sections. Table tracks are indicated by cross hatched lines. The small circle in the center is the bore for the spindle bush.

Fig. 5—Housings (at right) were made in two sections, as shown.



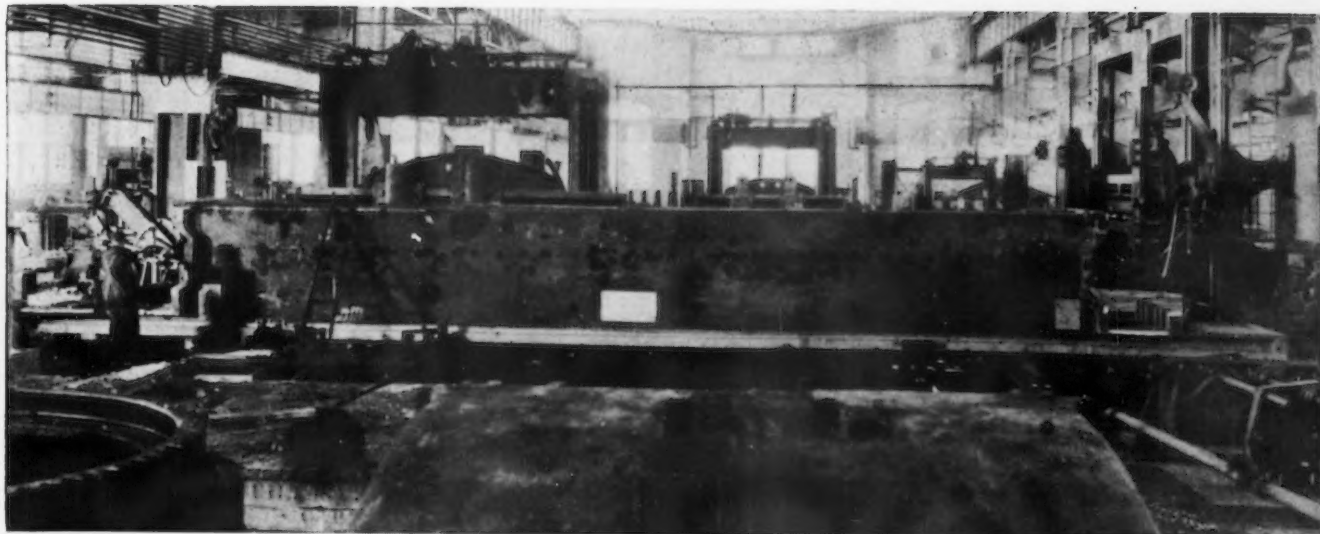


Fig. 6—Surfaces on the rear of the 40-ft. boring mill crossrail were machined on this 13-ft. planer equipped with side column.

to obtain suitable shipping dimensions.

The crossrail, which has a length of 54 ft., a face of 52 in. and a depth of 69 in. between the housings, was cast in one piece. On the rear of each end of the crossrail are pads for the feed and traverse bearings and the surfaces which bear against the housings. To plane these surfaces the crossrail was placed face downward on the forward

end of a 13 ft. planer table as shown in Fig. 6. The overhanging end was supported on a roller carriage which rolled back and forth with the motion of the table on a hard steel plate set in a concrete foundation. The rollers were equipped with anti-friction bearings. The other end of the crossrail had sufficient overhang from the edge of the planer table to place the sur-

faces to be planed within the range of a side column in front of the planer crossrail. The planing tool was held in a special reach head extended forward from the side column. Feed to the reach head and column was supplied from the regular feed mechanism of the planer. It was of course necessary to reset the crossrail to plane the surfaces on the other end.

Steel Making as Temperature Raising Rather Than Oxidation Process

THE steel making process was to be regarded as primarily one of bringing the molten mass to the desired temperature for teeming into the ingot mold, with the eradication and reduction of impurities as incidental. Such was the approach made to the subject by Lewis B. Lindemuth, consulting engineer, Chrysler Building, New York, in an address made before the Institute of Scrap Iron and Steel at Atlantic City. He essayed to bring out the place of scrap in the steel making process, expanding on his contentions already made at length in these columns (Aug. 18 and 25, 1932) that a reclassification of scrap is desirable. He is an exponent of establishing grades so that charges of the open-hearth furnace can readily be made up of different kinds of scrap and pig iron referred to a standard, all with an eye to maximum economy and quality, as explained in the article mentioned.

What he had to say at the Atlantic City meeting in regard to viewing steel making as concerned with tem-

perature as much as with composition is as follows:

If the steel-making processes were primarily a means of reducing "impurities" then to pay more for pig iron than for scrap, when the pig iron contains probably ten times as much of these impurities, just for the purpose of removing them, hardly makes sense.

We might better conceive of Bessemer, open hearth, or electric furnace operations as the means by which we increase the temperature of certain raw materials to a point where they may be satisfactorily poured into steel ingots.

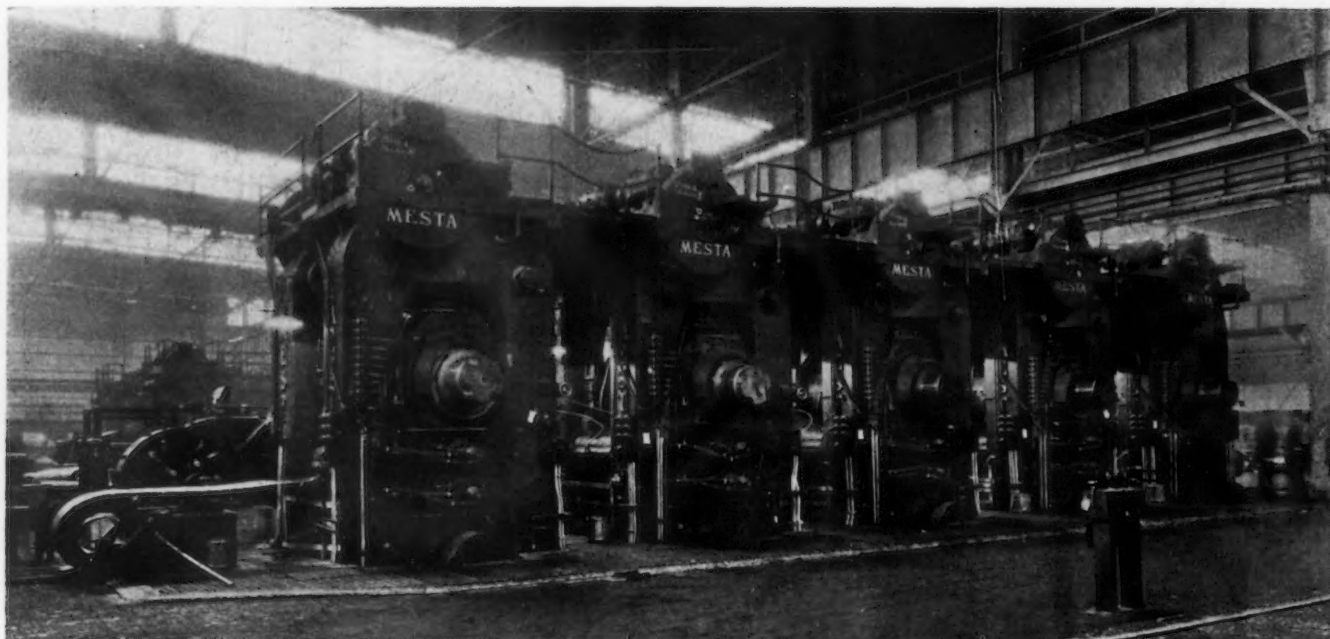
It so happens that the so-called impurities which we are called upon to remove are elements which combine with oxygen. Each of the three principal processes is a process which subjects the raw materials to an oxidizing atmosphere, the difference between them being a matter of degree. The raising of the temperature of the raw materials is a function of thermal in-

put, plus time. We therefore have a time element required for raising the temperature, during which the raw materials are subject to oxidation.

We might better, therefore, look upon the elements which have been removed, namely, carbon, manganese, silicon, and phosphorus, as elements called upon to protect iron from oxidation, but combining themselves with the oxygen during the interval required for securing temperature, and it is for these elements that we pay the extra pig iron price. This is probably a truer picture of the fundamentals of all the steel making processes than is the conception of them as impurity reducing operations. The reduction of impurities becomes an object only when, after the normal reactions, there remains an excess.

Basic iron, as you know, contains about 4 per cent carbon, 1 per cent silicon, 1 to 2 per cent manganese and a variable percentage of phosphorus. In the Bessemer process where air is blown directly through the metal, and silicon is the fuel, the oxidizing rate is extremely high. It therefore requires practically the entire pig iron content of these elements to serve as protection against over-oxidation by the time the temperature for pour-

(Continued on Page 78)



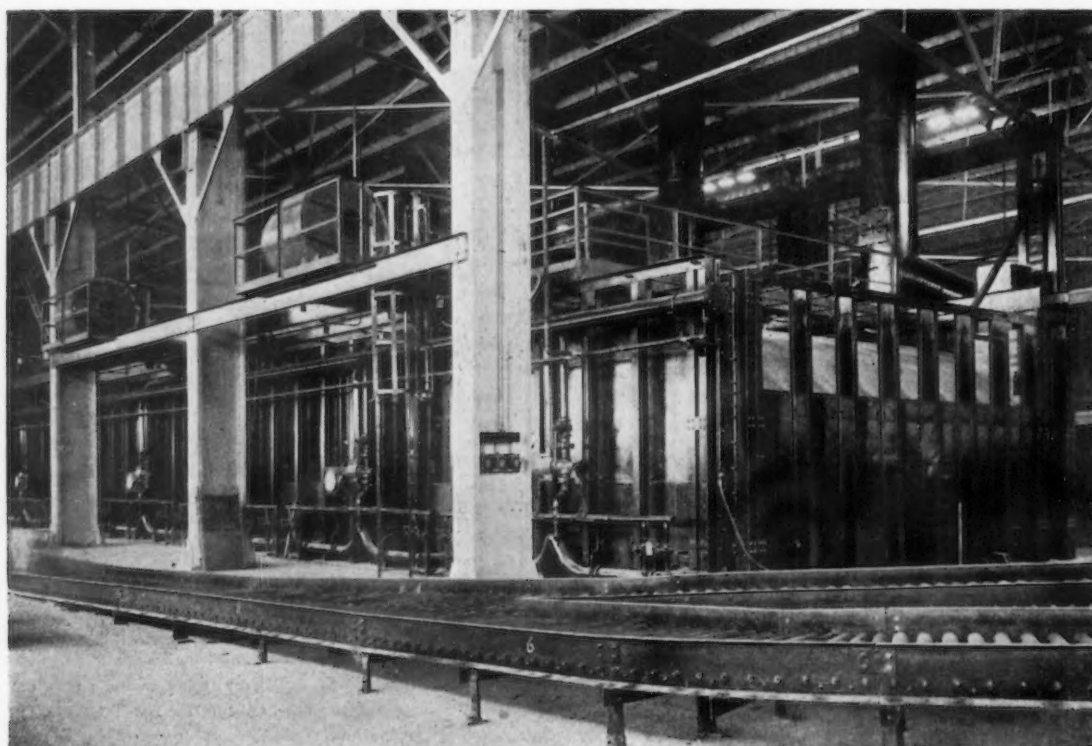
▲ ▲ ▲ New Inland Tin Plate

IN 1931 the Inland Steel Co. built a large continuous strip mill at its Indiana Harbor, Ind., works for the production of flat and coiled strip and plates. This mill is capable of rolling plates up to 72 in. wide. At the same time a cold rolling department was built, complete with the necessary continuous pickling equipment. In this

cold rolling department the hot rolled strip is reduced to desired gage by a series of cold mills in tandem, after which the material is cut to sheet lengths, annealed and finished. This mill produces cold rolled sheets principally for the automobile industry.

The company has now completed the third step in the original program and

has installed equipment for the manufacture of tin plate, the black plate being produced from the hot rolled strip by cold reduction. For this purpose, two mills have been installed. The first consists of a train of five exceptionally heavy mills through which the material passes successively, and is reduced to desired gage. This

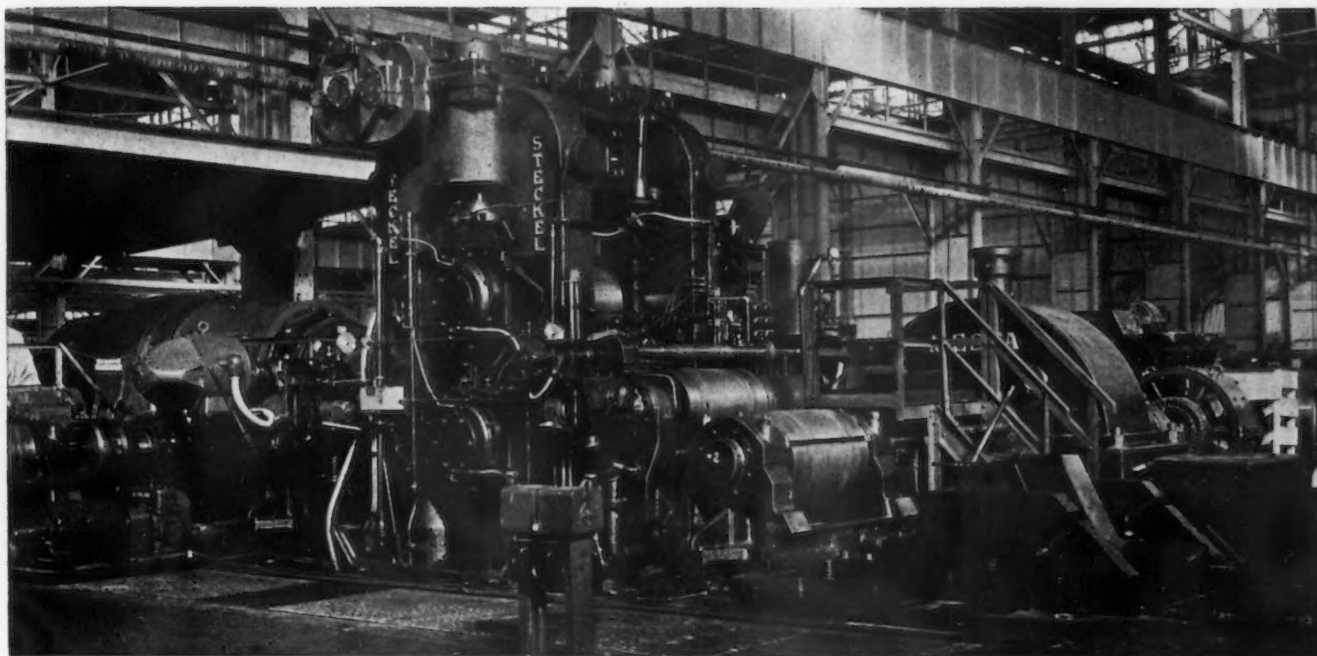


ABOVE

Hot-rolled steel strip is reduced in this new Inland tandem cold-rolling mill from No. 16 gage to No. 38 gage black plate 36 in. wide. The mill is equipped with gaging devices to insure accuracy of gage.

AT LEFT

Strip is annealed in these annealing furnaces of the new Inland tin plate plant before processing in the skin rolling mills.



Plant Now in Operation ▲ ▲ ▲

mill will be capable of rolling material 36 in. wide to No. 38 gage, or 55-lb. tin plate.

This mill has been built exceptionally heavy and is provided with ample power to make the necessary reductions in this wide material; and it is equipped with gaging devices to insure accuracy of gage of the finished material. The mill is designed so that

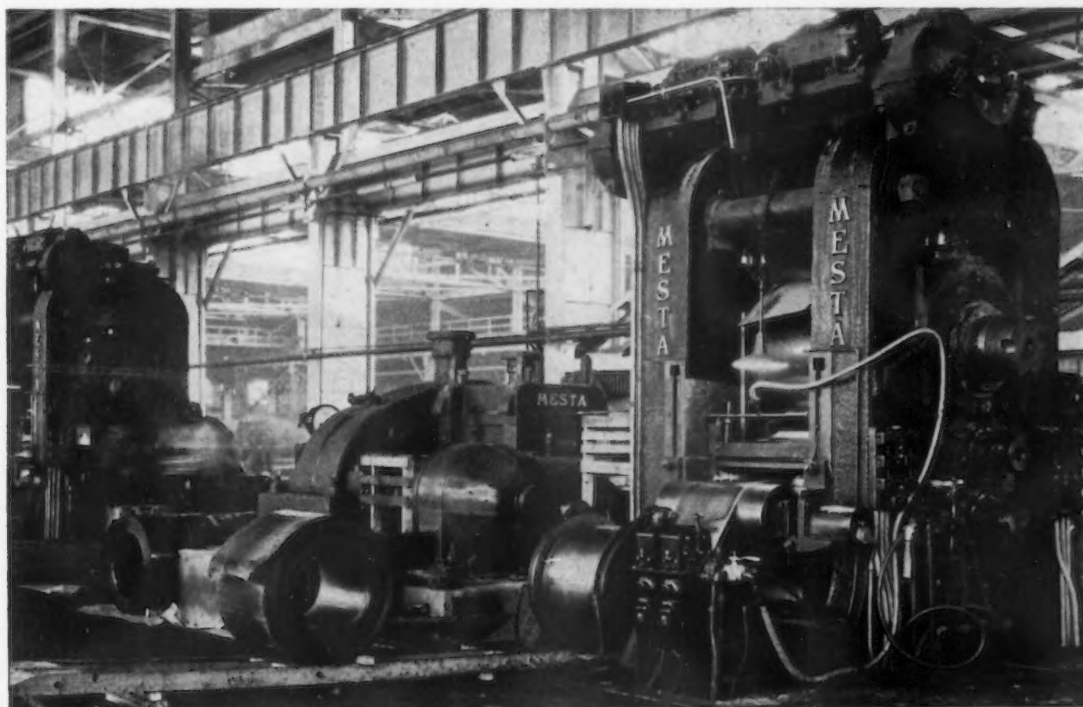
the maximum delivery speed may be as high as 700 ft. per min.

In addition to this train, the company has also installed a 38-in. Steckel mill principally for the purpose of producing light weight material. In this type of mill, as is well known, the hot rolled band is pulled back and forth between the rolls a number of times until the desired reduction has

been obtained. The working rolls are not driven, power being supplied by the reels on either side of the mill applying tension to the material. This mill has many novel features compared with previous installations of this type. It is anticipated that the capacity of these units will enable the company to produce 10,000 tons of cold rolled black plate per month.

ABOVE

Steckel mill in the Inland plant for rolling light gage steel strip which may be used for tin plate



AT RIGHT

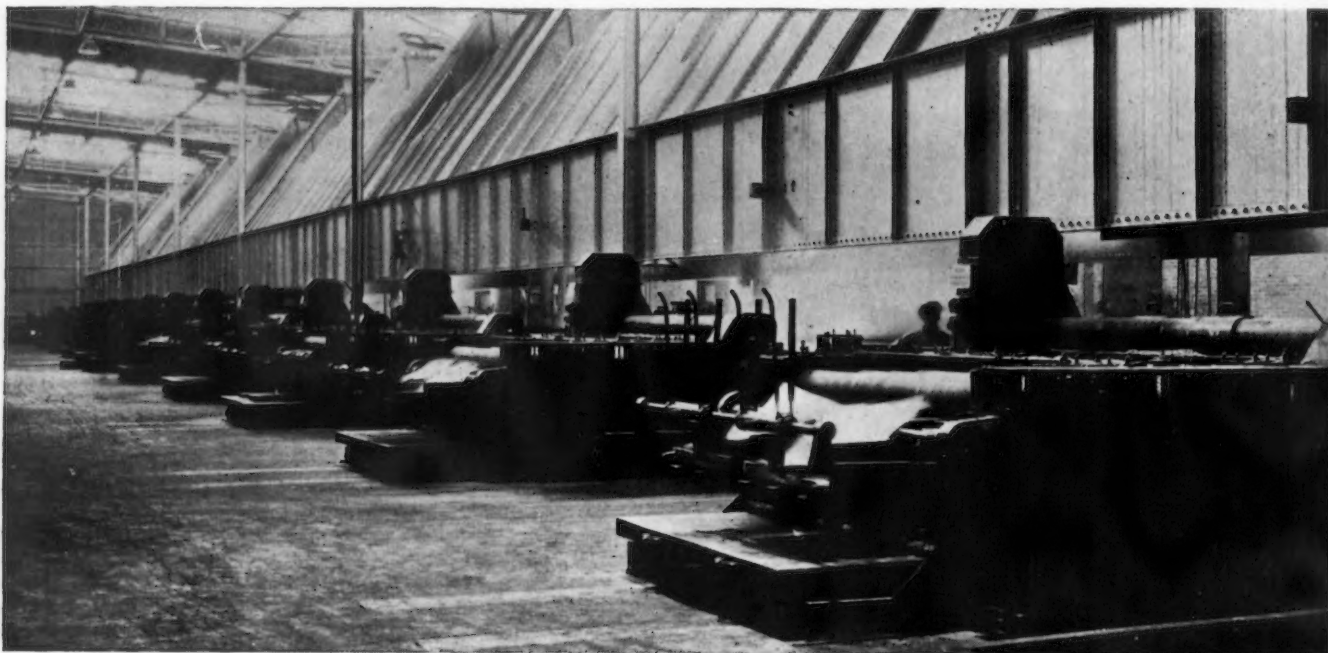
Annealed steel strip is finished in four-high skin rolling mills, and after trimming and shearing, it is in the form called black plate.

After the hot rolled bands have been reduced to the desired gage in the cold rolling department, they are transferred to a separate building where further processing is carried out. The first step is to free the cold rolled bands thoroughly of all traces of oil. This is accomplished in an electrolytic cleaning device, which is

sorted to eliminate any off weights or defective material. They will then be ready for the tinning operation, which will be similar to the process used in other tin mills. They will be given a white pickle immediately prior to tinning, and stored in boshes, from which they will be transferred to the tinning machines. The other operations in the

notes on new things in materials and processes.

"Our chemists," said Mr. Crane, "discovered after some study that natural patina is a basic sulphate. Prior to that it had been assumed it was a carbonate. This set us off on a new track, and led to the development of a solution, consisting mainly of ammonium sulphate. The coating formed



Delivery end of the tin pots of the tinning department of the new Inland tin plate plant.

particularly effective for this purpose. After the coils have been thoroughly cleaned and dried they will be annealed in a series of furnaces. The coils are generally mounted two high on the annealing bottoms and covered by a circular alloy cover, properly sealed to prevent air from having access to the coils during the annealing period. After the coils are annealed, they are transferred to a coil cooling building where they will be allowed to cool until reaching room temperature. As the coils are required for further processing they will be transferred to the skin rolling mills by tractors.

These skin rolling mills are of the heavy four-high type and are designed to allow any degree of cold rolling that may be required to give the necessary temper to the black plate. From these cold rolling mills the material passes into the trimming and flying shears, where it is trimmed to width and cut to length at a rate of approximately 300 ft. per min. The cold rolled bands are now in the form of black plate of the size required to fulfill customer's order. In this form the individual sheets will be inspected and

production of tin plate are the same as practiced in other plants.

The Inland Steel Co.'s decision to install this plant was part of the original plan of development to absorb the products of the strip mill installed in 1931. Superior surface, evenness of gage and other properties of tin plate production by the cold reduction method have been demonstrated to the full satisfaction of the Inland company, which considers that it now has the largest and the most complete installation of the kind.

Artificial Patina on Copper

THE development of a method for the artificial formation of natural patina on copper was announced by William M. Crane, Jr., of the Copper & Brass Research Association, in an address before the National Roofing and Sheet Metal Industries Conference, held at the Pennsylvania Hotel, New York, Feb. 8. Advance information had meanwhile been given in these columns by Edwin F. Cone (Oct. 19, 1933, page 28) in his budget of

by dipping copper into this solution was found to be identical in composition with natural patina.

"This led to the adaptation of the ammonium sulphate process to application as a spray, and that is the method we are using on installations. The method is inexpensive and simple, though requiring a definite technique. The chemicals used are readily obtainable and cheap.

"Five or six spray applications are required, with drying allowed after each. The copper must be clean and must have weathered long enough for a brown tarnish to have developed on the surface. The patina does not appear immediately. If a heavy rain comes along too soon, it will probably spoil the work by washing off the salt before it has had an opportunity to act. After spraying there should first be an appreciable period of high humidity, or dew, or fog, so that the salt can absorb moisture and become active. After 6 hr. or so of at least 80% humidity, the next rain will wash off the excess salt and bring out the blue-green color of patina. The color that develops at first is somewhat bluer than the natural patina, but on weathering the coloring approaches the natural shade."

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Improved Alloy Carburizing Containers

By E. F. CONE

In many heat-treating operations the modern tendency is to reduce the time cycle without deterioration in the product, accompanied, if possible, with an improvement in quality. An example of this trend as applied to the carburizing of small parts is apparent in one of the recent developments at the plant of the Timken-Detroit Axle Co., Detroit, where large quantities of small parts must be carefully and efficiently carburized. The improved container is the result of the work of H. W. McQuaid, now associated with the research department of the Republic Steel Corpn.

Carburizing is one of the arts which has shown relatively little change over the past 50 years. There has been a refinement in carburizing compounds, but they still consist essentially of a carbonaceous material such as charcoal, in combination with a carbonate energizer. One of the first carburizing compounds made consisted of calcium carbonate and charcoal. Furnaces, however, have been improved, and in the larger plants furnaces of the continuous type

are particularly favored. In most of the plants which are case hardening today the under-fired type of furnace

ALTHOUGH carburizing technique has changed but little during the past decade, there have been constant attempts to redesign containers in order to better case-harden small parts more efficiently. This article describes an improved cylindrical container fabricated from a Ni-Cr-Si alloy, which is said to greatly reduce the carburizing compound required, increase the exposed heating surface, and distribute the heat more uniformly than does the more usual type of container.

is almost identical with those which were used just after the Civil War.

In carburizing containers the greatest change has been in the use of heat-

resisting material to replace cast iron or cast steel. The introduction of the high nickel-chromium alloys has been a very valuable contribution to the economical operation of several large carburizing departments, but there are today many small plants which are still using carburizing containers made from cast or welded steel.

Almost invariably, even in the most modern type of plant, the carburizing box is of simple cylindrical design into which a considerable number of pieces are introduced. In designing the usual box, certain old ideas are followed as to the amount of compound between the work and the container, as well as the amount of compound in relation to the work. It is not unusual to have as much as one or two inches of compound between the container wall and the work, and also to have containers which measure from 10 to 18 in. in diameter.

Those boxes which were not of the usual cylindrical design are generally square or rectangular in section,

(Continued on Page 76)



Special carburizing containers of heat-resisting sheet steel and some of the steel parts case-hardened in them.

How Attractive Finish Helps Metal

SAND blasting is usually associated with foundry operations, but in recent years this method of cleaning has been gaining favor in many other branches of the metal working industry. The costs of blast cleaning have been greatly reduced by careful analysis of the variables involved, by the design of new equipment and by the development of processes which cut handling to a minimum.

In special cases as where specifications call for the cleaning of the margins only, of steel sheets, it has been found advisable not to purchase full pickled sheets for the job, but to buy hot rolled sheets and blast clean the edges.

By HERBERT R. SIMONDS

Those who have investigated the general practice of blast cleaning in this country have found that relatively few manufacturers have kept accurate costs and that hit-and-miss methods are frequently applied to determine the size of nozzles, the air pressure, the size and kind of abrasive particles used, and the character of the material handling equipment. Charles Boulton, Pangborn Corp., Hagerstown, Md., who has devoted a great deal of study to the subject of economy in blasting processes, states

that a comparatively few fundamental considerations stand between high cost production and profitable operation.

Sand Blasting Defined

The term "sand blasting" is commonly used to describe the application of an abrasive material under pressure to surfaces to be cleaned or otherwise treated. Even when steel grit is used as the abrasive, the term "sand blasting" is frequently retained. Compressed air, almost universally today, furnishes the blast power. Steam is occasionally used, and the new wheelabrator centrifugal process of the American Foundry Equipment Co., Mishawaka, Ind., is being introduced.

Some of the factors governing efficiency of general sand blasting are distance of the nozzle from the work, angle of the nozzle with the surface to be cleaned, character of the work itself, size of nozzle, kind of abrasive, and air pressure. Several of these factors in combination govern the amount of abrasive flowing, the amount of power required, and the quantity of work accomplished.

Changes in one factor, as, for instance, the nature of the work, indicate changes in other factors. To illustrate: a miscellaneous group of forgings would not be cleaned with the same nozzle angle as that used for cleaning a flat sheet. It is impossible here to give detailed specifications governing different conditions. General practice on flat surfaces, however, indicates an average distance, from the nozzle to the work, of about 8 in., with the nozzle held at an angle of about 40 deg. to the surface to be cleaned.

The Scope of Application

The sand blast now touches almost every phase of metal finishing. It enters into the production of bath tubs, beer barrels, crank shafts, small tools, and hundreds of other products. Telephones, the minute drills used by dentists, automobiles and railroad cars, all may find applications of the sand blast in some process of their manufacture.

As is the case with pickling equipment, sand blast equipment has under-



Stove parts at the plant of the Florence Stove Co., Gardner, Mass., are prepared on a high production basis for enameling on a rotary table sand blast.

Products Sales

Abrasive Cleaning—12

IN previous articles, various chemical and electro-chemical methods of preparing metal surfaces for final finish were described. Another general method of cleaning metal surfaces in preparation for enameling and other finishing is abrasive cleaning, which includes sand and steel grit blasting and abrasion by centrifugal action. Some of the features of abrasive cleaning, particularly as they apply to the preparation of surfaces for enameling, are here presented.

gone radical changes during the last few years, and blasting machines suitable for production line use are now available. The resistance to the purchase of elaborate equipment in the sand blast field is high because most users are familiar with the fact that they can merely attach a nozzle and an abrasive reservoir to a compressed air line and clean a surface. Dust is an annoyance, to be sure, but its actual cost to the manufacturer is seldom appreciated. Similarly, the user too frequently overlooks the cost of operating inadequate blasting equipment, which cost mounts with surprising rapidity.

This may be illustrated by a few actual cases. An engineer recently made an analysis in an Ohio foundry. He first listed the material cleaned, that is, the quantity and the weight of each item. He then listed the labor, the cost of air, and the cost of abrasives. Comparing his unit costs thus obtained, with standard costs which he knew were obtained elsewhere, he found that the cost for many kinds of castings was far too high, and this indicated the advisability of separating the work so as to handle part on one type of equipment and part on other and more suitable apparatus.

A 12 ft. diameter rotary table was recommended for much of the small work. The installation of such a table made it possible to use a conveyor system and eventually a saving of more than \$21.00 a day was effected. Such a table has a first cost of about twice that of a good blast room, but when conditions are favorable, a rotary table may pay for itself in a

comparatively short time and, in addition, may effect a saving in floor space.

A southern stove manufacturer cleans gray iron castings for enameling. Here also a room was used, but as production was increasing, some new equipment was necessary. A 12 ft. table here also was recommended, but to save initial expense an 8 ft. table was installed. After six weeks the 8 ft. table was shipped back and the recommended 12 ft. table installed. Just as serious a mistake of course may be made by purchasing too large a table for the service required. An idle machine is also an expensive machine, and too large equipment is either operated inefficiently or else must remain idle part of the time.

Equipment

Most minor difficulties have now been ironed out of all standard blasting equipment. Common practice is to control the sand blast pressure tank with a single lever convenient to

the operator. Normal equipment includes an automatic device for refilling the tank whenever operation is stopped. Thus this feature is incidental to operation without loss of time. In a blast room, ventilation is from air inlets in the ceiling, and the dust is carried off through openings at the floor level. It is common practice to use floor gratings with small openings so that such items as fins, wires, and gagers are kept out of the reclamation system.

For work within its range, a sand blast barrel provides the cheapest method of sand blast cleaning on a mass production basis. A sand barrel, however, must be rugged, to stand up under the severe demand made upon it. The load which is being cleaned is in constant movement, and thus for efficiency the cost of equipment and the speed of cleaning must be carefully balanced. Often it is advisable to use more barrels, rather than try and force those in operation. Many



This shows the method used for blast cleaning of heat treated finished gear rings and other similar parts, at the plant of the Allis-Chalmers Mfg. Co., Milwaukee. Note the compact arrangement of table, abrasive storage tank and operating controls.

different types of barrels are available. A perforated one-piece drum offers no lodging place for thin edges or coarse refuse. In New England one company operates 19 barrels, each with a capacity of a ton load and equipped with nozzles with double adjustment so as to bring the abrasive action at the most effective place.

Selecting the Abrasive

The abrasives are the cutting tools of the cleaning process and therefore

sand is run through the blasting process a part of it, usually from 15 to 20 per cent, disintegrates into dust. Therefore, in order to recover the good sand it is necessary to have a storage and reclaiming system. Most sands used for sand blasting weigh approximately 97 lb. per cu. ft.

Steel Shot and Grit

Steel abrasives are a cupola product and are available either in the form of round shot or in grit which

same work as the sand grain. Manufacturers familiar with sand in blasting, who switch to steel abrasives, are apt to select too coarse a grade.

Steel vs. Sand

Opinions differ as to the relative merits of sand and steel. Undoubtedly there are cases where each type of abrasive may have advantages over the other, and so general results without full details may be misleading. One of the largest electrical manufacturing companies reported the cost of abrasives, when cleaning with sand over a period of a full year, as 46c per ton of castings shipped. The following year, with a change to steel abrasives, the cost per ton of castings dropped to 23c.

Because of the high initial cost, steel abrasives are generally better suited to larger operations where the entire mass of abrasive can be reclaimed for repeated use. Some other advantages and disadvantages may be stated. Sand has a lower first cost, maintains its characteristics better in storage, has the property of absorbing moisture, which is often an advantage, and imparts to the work certain colors and finish characteristics difficult to duplicate with steel.

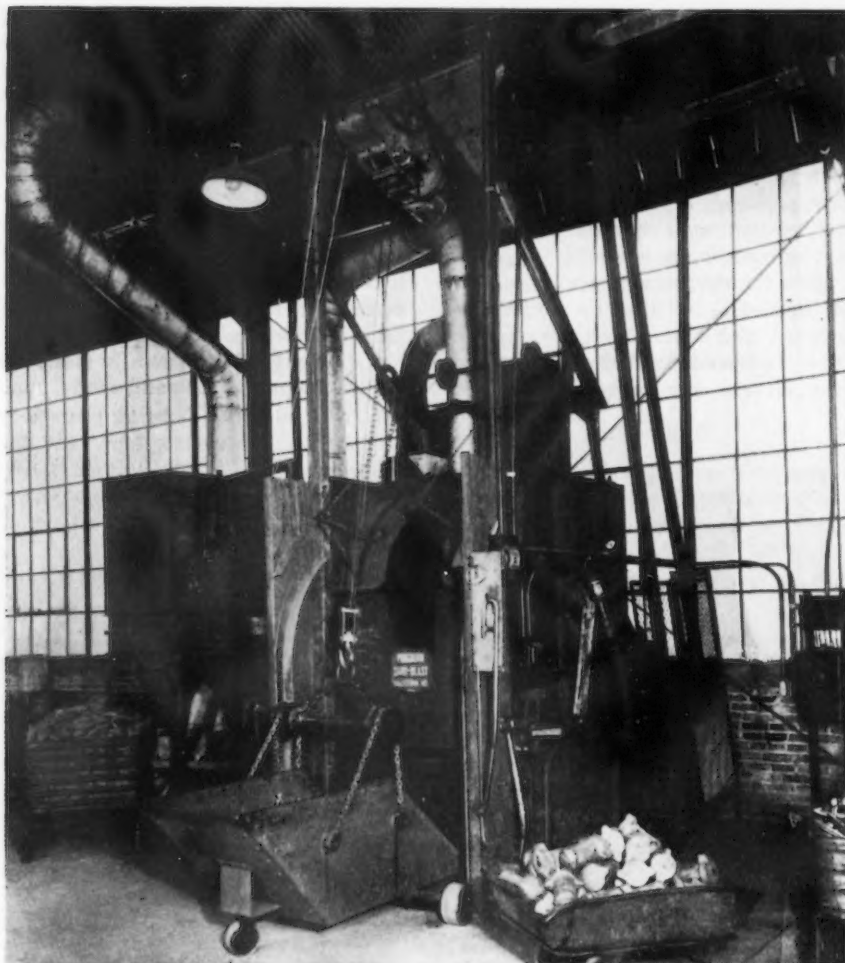
Some manufacturers use a small percentage of sand mixed with the steel, merely to get a silvery or aluminum finish.

Steel abrasives alone almost universally give a dark color to the clean surface and this again is often a misleading factor because those familiar with sand cleaning may be deceived by the dark effect produced by the steel abrasive and thus may apply the blast longer than necessary. Factors which should be considered in selecting abrasives are cost at shipping point, relative life, freight cost, handling cost, and cost of dust suppression and removal.

Steel Has Long Life

Mr. Boulton, in analyzing the large number of competitive tests between various grades of silica sand and steel grit, says that he finds comparatively little difference between any of the usual standard abrasive sands, but in the matter of overall cost, steel shot and steel grit usually show up favorably in comparison with sand.

On this subject he states: "Sand is composed of many minute crystals held together by a common bond. Impact disintegrates these crystals until all cleavage lines disappear and the abrasive becomes useless. Steel, on the other hand, is a solid, relatively homogeneous mass which does not dis-



Miscellaneous forgings are prepared for an enamel finish in this modern sand blast machine.

the correct selection of abrasive is important in determining low cost. The type of finish desired also governs the selection of abrasives to some extent. Thus sands produce a so-called matte finish. Ordinary bank or building sands are of little value. Ocean sands are much used, but a carefully selected and prepared white silica sand has greater resistance to disintegration, creates less dust, and enables faster cleaning.

Sand is graded into about four sizes, and the smaller sizes are more frequently used for cleaning sheets and rolled forms of brass, bronze, aluminum, or steel. Each time the

is merely shot which has been crushed. Steel abrasive is subjected to heat treatment to give added strength and durability. When shot is used, the action has more of a peining effect and does not produce the matte finish. The action of steel grit, on the other hand, may be controlled to closely approximate that of sand. The average weight of steel abrasives is 197 lb. per cu. ft. or approximately two times that of sand.

Experience indicates that the weight of the abrasive rather than the size of the grain should determine the selection. Thus a much smaller steel particle should be selected to do the

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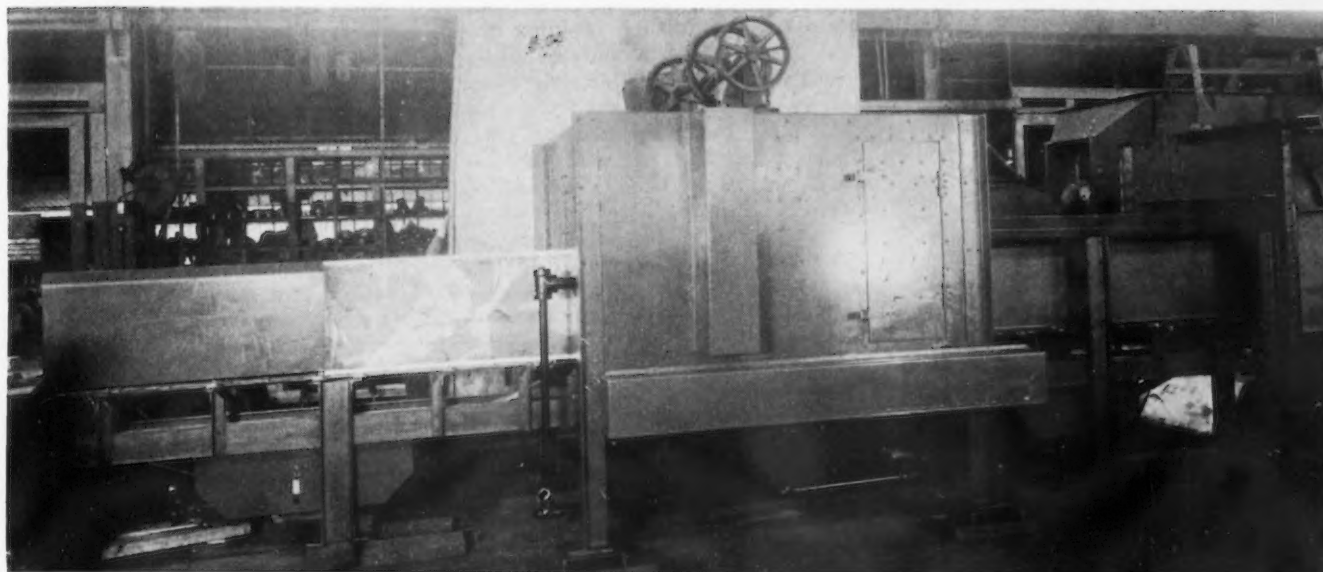
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This special marginal blast cleaning cabinet was designed for cleaning flanges only.

integrate or break up under impact. Instead, it wears away. It is reduced in size only after continual use averaging hundreds of times."

Handling Equipment

For preparing the surface of cast iron for enamel, the general practice is to use a sand blast with silica sand as the abrasive. Increased efficiency in this connection may be secured, according to F. A. Ebeling, sales manager, W. W. Sly Mfg. Co., Cleveland, by eliminating all unnecessary handling. This means straight line conveying from the foundry through the sand blast to the enameling spray booth. Racks and containers, Mr. Ebeling points out, should be of such

design that they fit in the production practice of each department.

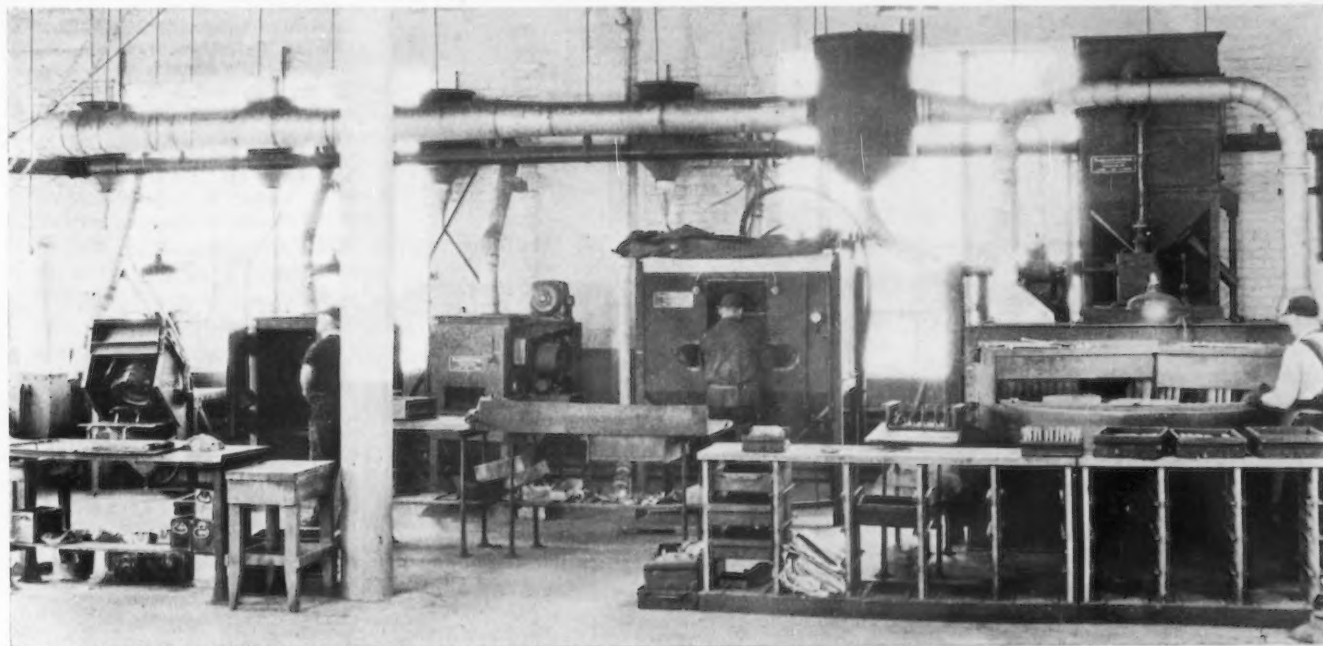
The proper timing for delivery from one department to another is important in order to cut down waste motion. One company has found a method of reducing its blast expense by using old castings, which are to be re-enamelled, as a back stop for green castings during the blast cleaning. In this way rebounding abrasive from the blast operation is utilized for the preliminary removal of the enamel on the back stop castings.

Cleaning Sheet Metal

The blasting process is being used successfully to clean sheet metal surfaces for wet process enameling.

Parts such as washing machine tubs and refrigerator liners are given a chemically clean surface by using steel grit, which is said to eliminate one operation, as against the practice of pickling. A record from a large refrigerator manufacturer gives a general idea of this particular process. The investment was \$4,000.00 and the production was two hundred 5 cu. ft. condensers per day. The air pressure was 80 lb. and the nozzle opening 1 1/2 in. The total daily cost was about \$47.00, or 23c per piece. Of this total the abrasive cost was \$10.00, the labor cost \$13.00, and the air and power cost \$19.00.

The recent extension of blast cleaning outside the foundry has been



At the plant of the Union Twist Drill Co., Athol, Mass., a series of different sizes and types of blast cleaning machines gives an efficient and flexible method of preparing all sizes of drills for the final finish.

found by P. J. Potter, engineering department, Pangborn Corp., to be most prominent for removing scale from forgings, billets, and alloy steel parts. One particular advantage he has found is that the equipment can be easily placed in the line of production. He finds that under proper conditions there is no residue left on the clean surfaces which will hinder subsequent operations, and, also, there is no appreciable loss of metal. An important feature in connection with the manufacture of parts for airplane engines, is blast cleaning for inspection purposes. Cracks and faults of any kind show up much more easily after cleaning.

Centrifugal Cleaning

The first successful commercial installation of centrifugal cleaning of metal surfaces was made at the Inland Steel Co., Indiana Harbor, Ind., in April, 1933, according to Verne E. Minich, president, American Foundry Equipment Co. This was a so-called wheelabrator used for removing scale from billets which later were rolled into bumper stock for Ford and Chevrolet motor cars. Since then the wheelabrator has been installed for

many services, including cleaning sheets for galvanizing, cleaning the edges of skelp for making electrically welded pipe and in fact for almost any cleaning operation ordinarily handled by pickling or sand blasting. Mr. Minich says: "In our new wheelabrator we have found a means of obtaining directional control and so are able to discharge the abrasive over the exact area desired. In previous attempts to use centrifugal force to discharge abrasive against sur-

faces to be cleaned, the action of the abrasive has quickly destroyed the wheel. We feel that we have overcome this difficulty, and operation so far indicates a large saving, which as a minimum, is the difference in cost between the production of compressed air and the low power cost required to operate the wheelabrator. I might add that in the successful use of this equipment we employ a combination of centrifugal, tangential, and air-dynamic forces."

To Repeat "Porcelain Enamel Parade"

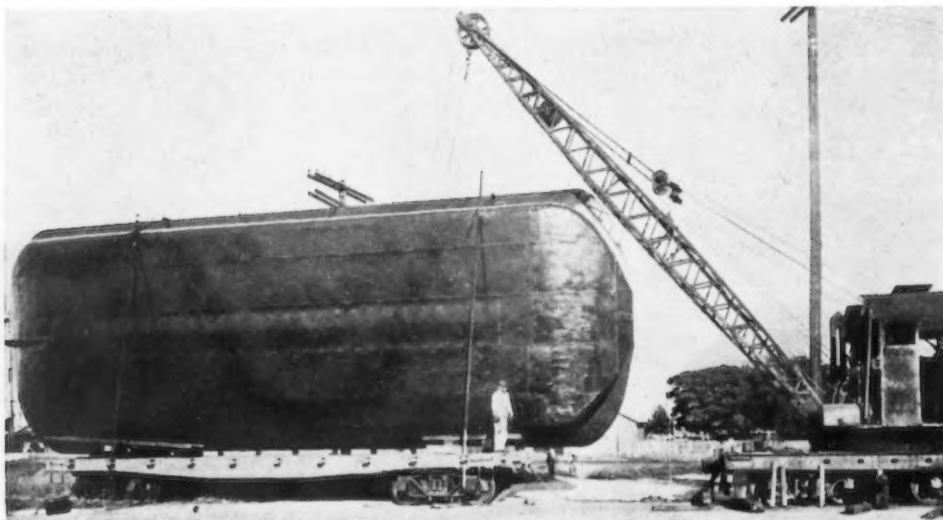
PLANS for the revival of the "Porcelain Enamel Parade" at the 1934 Century of Progress Exposition in Chicago, this summer, are well under way, according to the Porcelain Enamel Institute, sponsor of the exhibit.

Last year the Parade consisted of 44 individual displays, augmented by an educational exhibit in the form of

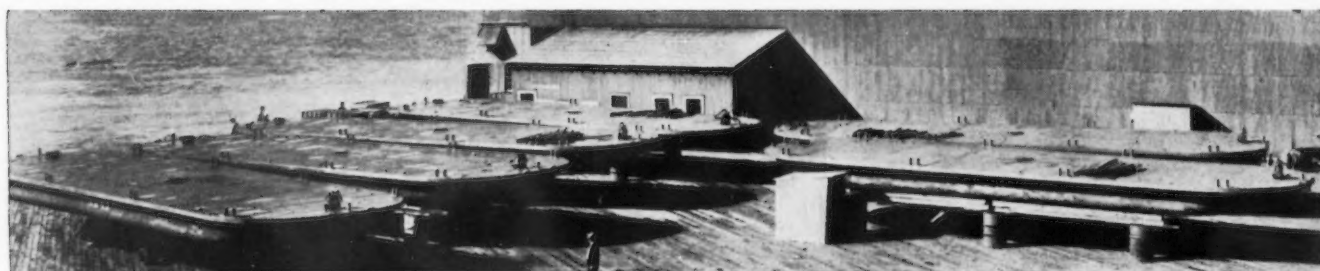
a porcelain enameling plant, where ash trays were manufactured. According to the Institute, more than 6,000,000 people saw last year's exhibit.

The general theme of last year's exhibit will predominate, inasmuch as the enameled red, white and blue soldiers will identify each exhibitor's space; however, it is planned to improve the educational exhibit through the introduction of physical tests on enameled products.

All-Steel Barges Will Transport Bananas



SIX of 27 welded steel barges, built recently for transporting bananas in shallow waters, are shown in the accompanying views. They were constructed by the Equitable Equipment Co., New Orleans, for shipment to Central America. Each barge is 60 ft. long, 20 ft. wide and 3 ft. deep, and has a draft of 6 in. Hulls and decks were fabricated from $\frac{1}{8}$ -in. steel plate. Details of welding may be seen in the view of the bottom of a barge. A General Electric WD-200-amp. welding set and G-E type F electrodes were used in this work.

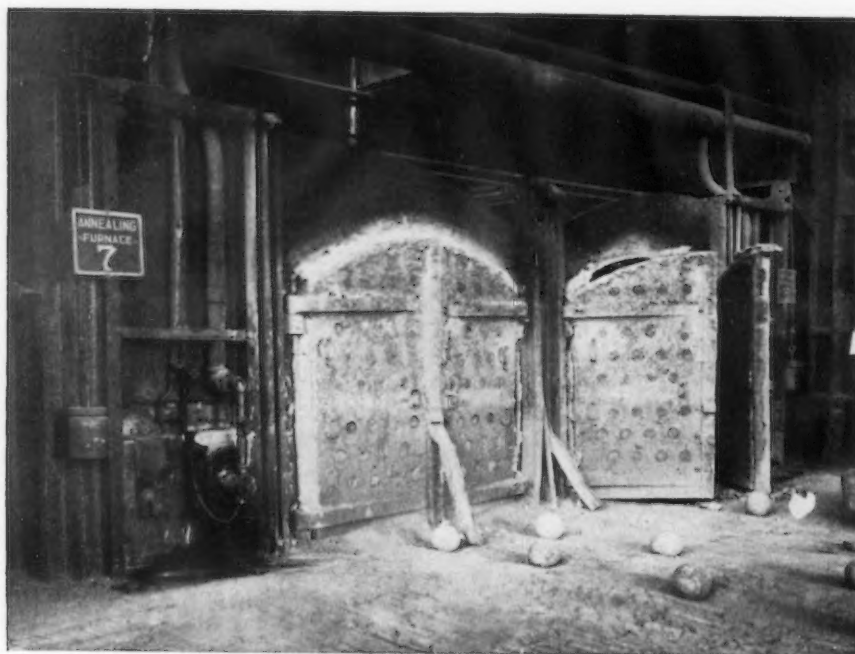


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STANDARD POST CARD CO. 385599
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The Iron Age, March 1, 1934—25

Oil Consumption of Heating



The sheet box-annealing furnace is side fired by two 1½-lb. air-5 to 25-lb. oil burners.

VALUABLE data on the performance of oil-fired furnaces in various kinds of service were recently compiled by A. J. Fisher, fuel engineer at the Maryland Plant of the Bethlehem Steel Co. He contributed the tabulation to a heat-transfer symposium conducted as a feature of its annual meeting by the American Society of Mechanical Engineers. In the discussion Mr. Fisher devoted himself to fuel oil burning, and among his observations, which were broad in scope, were the following:

Low-pressure oil burning (1½ lb. air, 5 to 25 lb. oil) has been so much improved in recent times that accurate relations between oil and air can be maintained indefinitely. One or more burners may be operated in parallel, either by hand or by automatic temperature control, with each burner taking a definite proportion of the load and accurately maintaining any desired furnace atmosphere throughout all rates of the furnace load.

Steam atomization of fuel oil is being replaced by mechanical atomization. Steam atomization is accompanied by too high a flame temperature and spotty distribution for use in most furnaces, and it does not lend itself to accurate hand or automatic control. The mechanical flame has a

lower temperature, good distribution, and can be accurately controlled either by hand or automatically by simple means. Steam adds to the price of the fuel, increases the wear on the furnace due to increased flue gas volumes and makes heat losses to the stack larger.

Steam atomization of oil in heating

furnaces operating at temperatures above 1800 deg. F. oxidizes the steel more rapidly with more possibility of burning it than in furnaces mechanically atomized. The reasons for this are two-fold:

1. In low rates of fuel flow and periods of soaking, the steam is usually left on the burners. This leaves the furnace atmosphere partly or completely composed of water vapor and entirely without free carbon. Consider that water vapor scales steel at approximately the same rate as pure oxygen above 1800 deg. F. and the disadvantage of steam atomization can well be appreciated.
2. The mechanical flame, entirely without steam, causes the oil to burn in a smoky carbon flame similar to producer gas. This slow moving carbon flame fills the furnace and heats the product evenly with minimum oxidation. The smoky flame precipitates carbon, which settles on the material to be heated, thus protecting it from oxidation. Small mechanical oil burners have been used with amazing results in clear flame gas-fired furnaces to precipitate carbon on

Performance of

	Size of Hearth	Hearth Area, Sq. Ft.	Average Size of Material Charged	Method of End burners;
Open-hearth	.....	845	.....	End burners;
Plate, Reheating	32' 9" x 9' 2"	300	5 x 44	Mech. roof fired—
Plate, Reheating	32' 9" x 9' 2"	300	8 x 20	Mech. roof fired—
Flanging, Reheating	11' x 7' 6"	82.5	24 dia.	1½-lb. air-
Flanging, Reheating	16' x 20'	320	10 dia.	1½-lb. air-
Patenting, Wire	5' x 50'	250	No. 5 ga.	1½-lb. air-oil;
Pot Annealing, Wire	7' 2" x 2' 10" dia.	63.7	No. 9 ga.	1½-lb. air-oil;
Lead Annealing, Wire	120,000 lb. Pb.	168.4*	No. 12 ga.	1½-lb. air-oil;
Galvanizing, Wire	65,000 lb. Zn	130.5*	No. 12 ga.	1½-lb. air-oil;
Caustic Soda Annealing, Wire	2,500 lb. Na OH	66.6*	No. 11 ga	Mech'h—natural
Galvanizing, Pipe	160,900 lb. Zn	138.0*	1-in. pipe	1½-lb. mech'l
Pair Heating, Sheets	52' 3" x 10'	522.5	32x12x0.43	1½-lb. air mech'l
Pair Heating, Sheets	17' x 4' 6"	76.5	32x12x0.43	1½-lb. air-
Box Annealing, Sheets	18' 7" x 8' 6"	158.3	40,000 lb. chg.	1½-lb. air-
Jobbing Mill, Sheets	.....	245.0	175 lb. slabs	Steam atomized
Box Ann'l'g (White) Tin	.....	210.0	11,000 lb. chg.	1½-lb. air-

*Surface exposed to fire, sq. ft.

and Metallurgical Furnaces

the steel, thus protecting it from the water vapor content of the gas fuel.

Many unsuccessful applications of fuel oil to metallurgical and shop furnaces can be traced to steam atomization. This is particularly so when direct comparisons with gas as fuel are made. However, with mechanical atomization the two fuels may be rated evenly in practically all cases.

Control of Flame Temperatures

The control of flame temperatures in fuel oil burning has demanded much attention because of the usual high flame temperatures of fuel oil. In melting furnaces maximum flame temperatures are desired provided the flame can be focused on the bath and not near the brickwork, whereas, in heating furnaces, a somewhat lower temperature is wanted.

In general, flame temperatures may be controlled by the following means:

1. Preheated air to increase flame temperature by using the waste gas as a means of regeneration in heat exchangers or checker work.
2. Degree of fineness of mixture between the air and the oil. A perfect mixture, which is explosive,

gives the highest flame temperature, whereas, imperfect mixtures are slow burning and tend to distribute the generated heat of combustion, giving a lower flame temperature.

3. Recirculation of the cooler burned gases in the combustion chambers

or by premixing them with the air for combustion. This method is the cheapest and easiest method of reducing flame temperatures.

4. Low temperature gasification and partial combustion of fuel oil by steam and primary air, and complete combustion by secondary air. This method carries the expense of steam and the evils of water vapor. It is also difficult to control automatically. However, it is used with good success particularly on the lower gravities of oil.

Practically all process work in furnaces requires accurate temperatures and accurate furnace atmospheres. Because of these facts, the full-floating type of temperature control is more satisfactory than the on-and-off control. The former guarantees positive pressure in the furnace at all working conditions, which prevents any air infiltration. The stumbling block to the use of oil on finer quality work furnaces has been in its difficulty of control and dependability as compared with gas. Recent development in instrument control and burner manufacture have made fuel oil control as delicate as that of any other type of fuel.

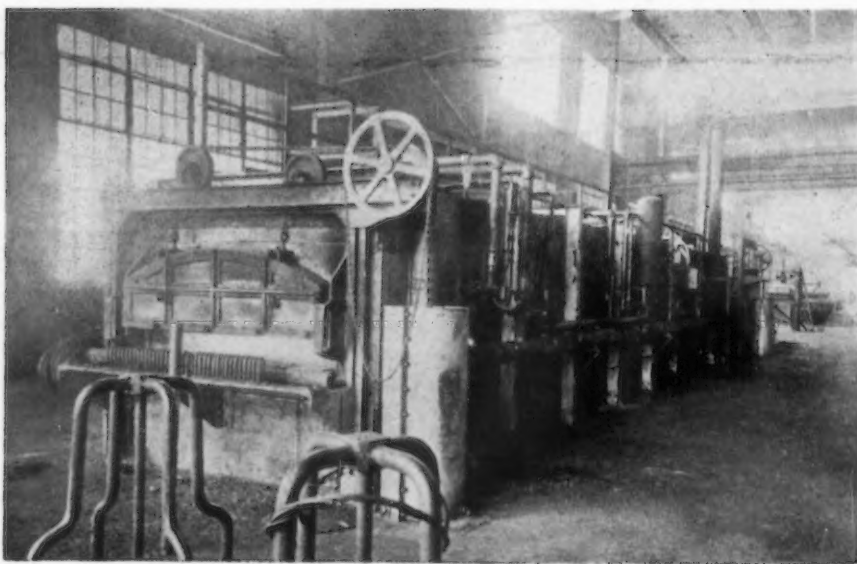
In high temperature oil-fired fur-



75-ton pipe galvanizing pot, with a rated capacity of 10 tons an hour, is fired by four 1½-lb. air-mechanical atomizing oil burners at the four corners. All four burners use the same amount of oil and air and are controlled by the use of a single oil and a single air valve.

Oil-Fired Furnaces

Firing	Product Per Hour Tons	Oil per Hour Gallons	B.t.u. per Ton of Product	Product per Hour per Sq. Ft. Hearth, Lb.	Temp. Charge and Discharge Deg. F.
steam atomized	13.6	415	4,640,000	36.1	725 to 2400
regenerative—direct	4.6	105	3,480,000	34.4	1000 to 2300
regenerative—direct	3.75	90	3,640,000	28.0	70 to 1800
oil—direct	0.668	13.4	3,060,000	4.98	70 to 1800
oil—direct	1.18	29.5	3,800,000	8.88	70 to 1850
cross and roof fired	1.54	29.2	2,860,000	13.6	70 to 1650
tangential	0.104	22.0	3,180,000	3.59	70 to 1300
mech'l-dutch oven	3.34	20.8	2,934,000	43.6	70 to 950
mech'l-dutch oven	1.67	14.6	666,000	28.2	
draft—indirect	0.204	6.5	4,800,000	6.75	70 to 1150
—direct—four corners	8.0	64.5	1,210,000	130.0	70 to 950
—cross and indirect	7.15	40.0	840,000	30.1	70 to 1550
mech'l—cross	2.25	20.0	1,310,000	65.0	70 to 1400
oil—cross	0.6	17.4	4,360,000	8.37	70 to 1500
—regenerative—direct	3.33	70.0	3,150,000	30.6	70 to 2000
oil—indirect	1.11	8.3	1,120,000	11.65	70 to 1100



This wire patent annealing furnace is equipped with 1½-lb. air-mechanical oil burners with air-oil ratio controls. The furnace is divided into two zones of control. The first zone is hand control and the second zone (finishing end) is automatic full floating control.

naces, checker design is of paramount interest. The regenerator is the heart of the furnace. The chambers should be well insulated and tight to insure them against any possibility of air infiltration. The regenerative furnace should always be operated under positive pressure by hand or preferably by automatic control. This necessitates the use of a forced draft fan.

Flame character plays a very important part in oil heating. In open-hearth work where a single burner is used, a long slow burning flame laid down close to and over the entire length of the bath appears to be ideal. This gives maximum temperature directly over the bath where it is needed most.

The long flame is also very desirable in firing metal pots for lead annealing, galvanizing, tinning, etc. In these cases a flame of even temperature can be laid alongside the metallic surface of the pot, giving uniform heating at maximum heat input rates. Generally speaking, the long oil flame can be used in many cases where multijet gas firing is used.

In heating furnaces, the oil flame can be either long or short depending entirely on the furnace design.

In cases of very particular work dealing with delicate surfaces, it is always safer to use a combustion chamber for oil firing. This is particularly so if automatic control is used and varying loads are encountered. In this case there will be times of extreme turn-down when atomization may be too coarse and oil particles may drop on and spoil the work. A safe minimum rate can be set in most control work below which the control cannot go, thus insuring good

atomization at all times. However, most of the reheating furnaces may be directly fired without combustion chambers.

Gas velocities are very important in furnace design. Reheating furnaces should be constructed for maximum re-circulation of the gases. Heating capacity can be increased by higher velocities since heat transfer is a function of the speed of the gases. Some manufacturers have gone so far even as to design heat resisting re-circulating fans for this purpose. Not only faster heating but even uniform heating has been the result.

The accompanying table gives actual performance data on oil-fired furnaces.

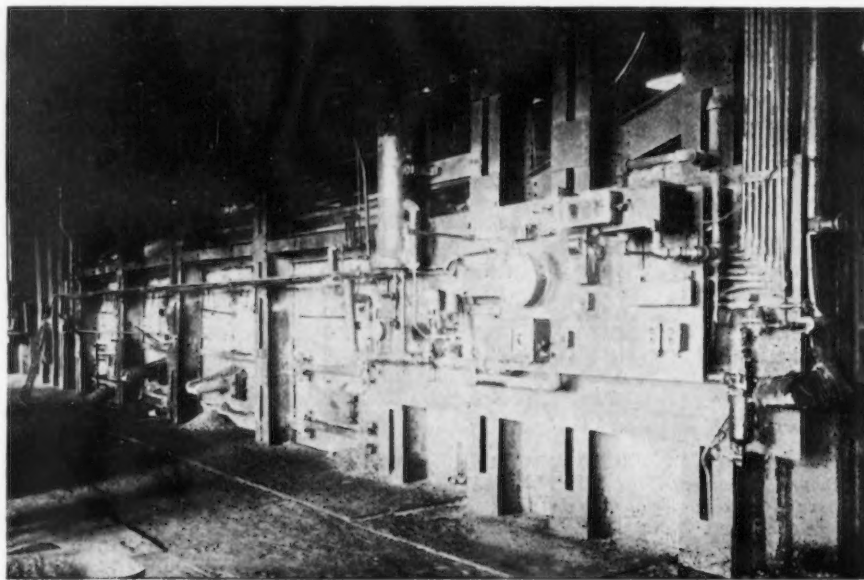


Plate mill reheating furnace has mechanical roof-fired oil burners, two-pass checkers, forced draft, automatic furnace pressure control, automatic adjustable time reverse and recording oil flow-meter.

New Method Simplifies Wage Cost Distribution

(Concluded from Page 25)

are made by check, and on the check stubs are listed all the deductions, as well as the total number of hours and total earnings. These stubs are retained by the employees and are the receipts for deductions made.

After the pay checks for each department have been written, the total amount of the checks is compared with the total of the payroll sheets, providing the check for accuracy.

Wage costs are then entered on distribution sheets, one sheet for each department. After all the figures have been entered, the columnar totals are cross added, and if the grand total agrees with the total of the payroll sheets, the distribution is assumed to be correct.

In commenting upon the use of this system, Mr. King said: "We have reduced clerical expenses by 50 per cent and have also eliminated many possibilities for clerical errors. The entire system is self-balancing and we are able to furnish detailed cost reports more quickly than formerly.

"Three days after the closing of the payroll we are able to give the production executives detailed reports showing costs of each operation in every department, and the ratio of cost to production. These reports are filed and used for comparative purposes, revealing the variation in costs from month to month.

"Branch plant reports are made daily, making it possible to control all branch plant operations readily.

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L. S. HAMAKER

IF the steel industry has learned any lesson from the depression from which we are now definitely emerging, it is that its chief problem is no longer production, but merchandising, and steel is perhaps the last big industry to see the light. I believe that our industry is on the threshold of an era of special steels, tailor-made steels, if you like, which will take the place of much of the so-called "tonnage" of today. Barring such unnatural upheavals as wars of the first magnitude, which may happen, I question whether the steel industry will be forced to operate at full rated capacity for a long time to come. I can't conceive of other steel-consuming developments such as the march of railroads across our western plains, or the spectacular growth of the automotive industry during the past 20 years, or even a building boom such as we had in the years following the World War. This may sound pessimistic, but I do not mean it to be so. There will be good business in steel and there will be reasonable profits in steel, but they will come as the result of alert adjustment to the needs of the times, of research into better materials and methods and of smart and skillful merchandising.

During the past century any basic industry could depend on the passage of time to cover up errors in business judgment, particularly with regard to expansion of productive capacity, but we can rely on this no longer. This country enjoyed a mushroom expansion such as the world never before

*An address before the Southern Association of Purchasing Agents, Birmingham, on Feb. 12, 1934.

Merchandising Steel In a New Era*

By L. S. HAMAKER
Sales Promotion Manager
Republic Steel Corp., Youngstown

witnessed. We were doubling our population about every 30 years, until 1900. Since the turn of the century we have grown more slowly, and the best authorities predict that we will shortly reach a point of stability in population and perhaps even of declining numbers. The whole American theory of business is based on continually expanding markets and such rapid expansion has covered a multitude of business sins, but those days are gone and it behooves all of us to begin working out ways and means to serve a stable market, to induce it to absorb more of our own product by making the product more serviceable, more attractive and more desirable. The relative scarcity of new consumers must be compensated for by raising the standards of living, by the development of new desires, new markets and new products.

New Conception for Steel

This is an entirely new conception for the steel industry to face. The industrial giants, as typified by "the incredible Carnegie," are still among those present in our industry in very sizable numbers, although somewhat mellowed by the years. It is not at all easy for men raised in the school whose slogan was, "We make steel; come and get it," to realize that steel must be merchandised, but those who can't get the picture are going to find the going tough in the years immediately ahead. I could be shot at sunrise for saying that steel is becoming a young man's business, but I think it is true. So I believe, gentlemen, that you are to be treated to the spectacle of basic industries such as steel actually selling scientifically in the next ten years, because the pioneer era in America is just about over.

Steel in 1934

Speaking generally, the welfare of steel in 1934 will depend upon the progress of four major industries—

automobile, building, railroads and oil. Nineteen Thirty-three was a much better automobile year than 1932, but it was still a long way from the industry's four and a half million car normal capacity. This year will be an even better one, some of the more optimistic Detroit producers laying their plans for a 50 per cent increase. Considering the reception the new cars are getting from the public, I think we are well justified in expecting a two million passenger-car year. Cars have for some time been passing out of use in much greater numbers than they have been bought. I think we may forget the "two-cars-in-every-garage" idea for a year or two yet, but even one car in every garage will mean mighty good business. And people accustomed to automobiles will have them the minute an income is reasonably certain. The automotive industry represents one of the brightest spots on the steel horizon for 1934.

With regard to building, the picture isn't so pleasing. Public expenditures will account for a high percentage of the total. They accounted for more than 60 per cent last year, not a very healthy condition. Even if the Government is successful in spending two billions of dollars this year, it will still be pretty thin compared to a normal building year of four and a half to five billion dollars. Commercial and industrial building have both far over-run all current requirements. We read of a shortage of new homes. It is true that families have doubled up everywhere, but a check of the vacancies in any average city will show that they just about equal the number of families' who are sharing quarters with relatives. A great deal of renovating must be done to put existing property in livable condition, but I don't believe we can expect a revival in residential building until mortgage money once more becomes available, and I don't think it will be available until the banks of the coun-

(Continued on Page 47)

Making Chevrolet's Knee-Action

By JOHN M. BONBRIGHT

A STEEL bar, rolling red-hot from a furnace, is seized in tongs by asbestos-gloved workers and threaded end-on into the jaws of a massive machine that winds the 93-in. bar into a glowing coil 10 in. long—and another knee-action spring is born.

Strips of heavy-gage steel plate are fed through a series of gigantic stamping machines, and two of the resulting oddly shaped shells are clamped together for an instant in a spluttering, flashing electric welder—to emerge after a spectacular display of pyrotechnics as armored housings for knee-action spring assemblies.

Incandescent chunks of tough alloy steel are laid between the hairbreadth dies of great steam hammers and presses, and removed ready for the machining operations that transform them into steering knuckles, king-pin support yokes, or other elements that combine with the coil spring and the housing to form complete knee-action units.

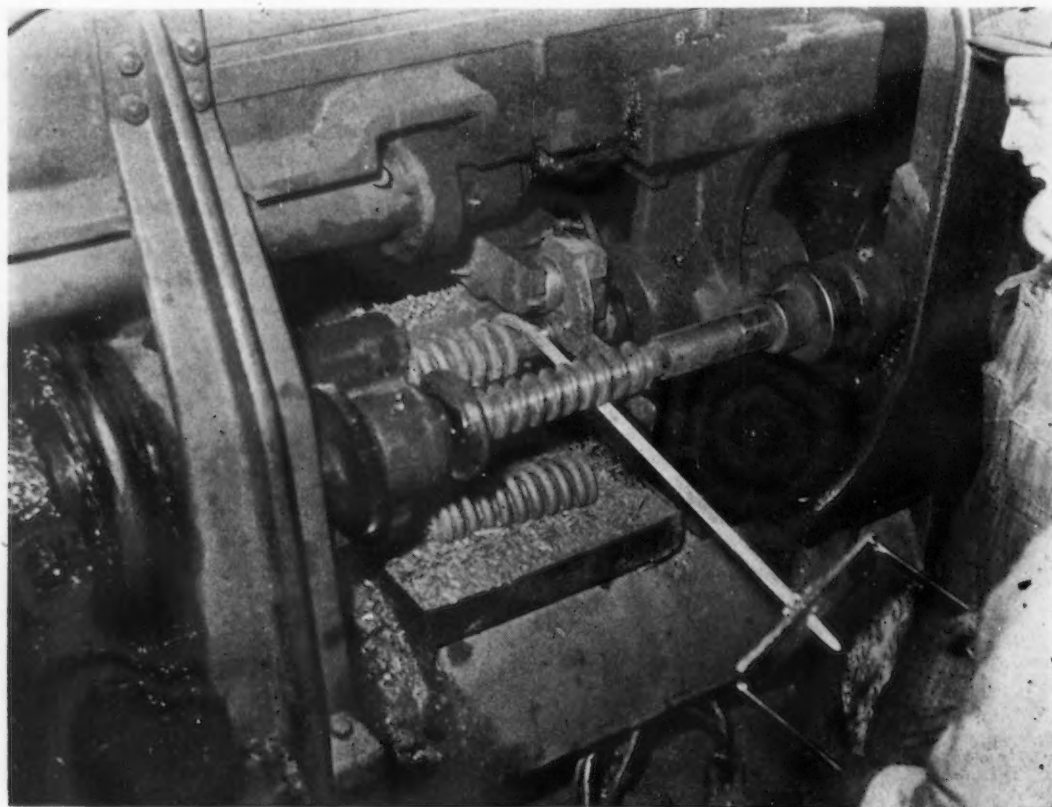
At the rate of 170 sets an hour,

22½ hr. a day, the component parts of Chevrolet knee-action assemblies are flowing through the manufacturing processes, from raw material to parts finished to the thousandth of an inch, to be transported by conveyors toward the assembly line of the Chevrolet spring and axle plant in Detroit—to be inspected, tested, assembled, tested again, and finally mounted on complete front-end units. Every day now, 3825 of these assemblies, comprising not only the spring actions, but brakes and brake drums, steering connections, shock-absorbers, and front cross-members, are lifted from the conveyer for shipping to the nine assembly plants throughout the country where complete Chevrolet cars are produced.

To achieve, in so short a time, the high rate of orderly production of units that involved practices totally new to the automobile industry, is the final triumph of the Chevrolet organ-

ization in its determination to revolutionize motoring by changing the roughness of the ride to the smoothness of a glide. First came the decision that, to attain the utmost in riding qualities, the conventional stiff front spring (a compromise between the softness needed for a smooth ride and the stiffness required to maintain axle alinement and true steering) must be eliminated—to give place to a construction in which the spring should have no other duty than easing the ride. That decision entailed endless experiment and testing to evolve the best solution of the problem—to eliminate all but the most suitable and satisfactory design from a dozen types of independent front-wheel suspension. Even when the best type for Chevrolet was determined, there remained the job of adapting, from the countless possible variations of spring action, shock-absorber control, wheel alinement and steering hook-up, the one combination most suitable to the size, weight and speed of Chevrolet cars.

When the engineers had arrived at



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The pointed end of a red-hot bar of spring steel is inserted in jaws at the left of the winding arbor. The arbor and the deeply grooved lead screw are then started. As the rod wraps around the arbor, the lead screw guides the rod at the proper rate to give the required gap between the coils. As the end of the rod passes from under the lead screw, the rod is pressed close to the arbor by a heavily loaded roller shown at the right end of the arbor. The arbor is then withdrawn to the right by hydraulic action, letting the completed spring drop into the tray. A battery of these machines has a capacity of 6000 every 24 hr.; additional equipment to be installed will increase the capacity to 10,000.

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their goal, there was still one great task to be done—that of designing and procuring the machines and tools to produce the parts, fixing upon the processes and inspections to meet the exact specifications, and creating in the Detroit plant the organization and system needed for the quantity production of knee-action equipment on a large scale. It meant new machines, new methods, new man-power.

First Production Set-Up for Manufacture of Coil Springs

The quantity production of high-quality heavy-duty coil springs, the most exacting unit of the new device, had never been attempted before; it was new not only to the motor car industry, but to all industries. Coil springs, of course, are not new; but heretofore, when required in any considerable quantity (as for freight-car trucks) there was no need for exact manufacture to attain precise sizing, capacity, or spring rate; and when accuracy was demanded (as in gun recoil devices), the quantity required was comparatively small.

It was necessary, therefore, for Chevrolet to make the first production set-up for the manufacture of large coil springs held to close limits, accurate to standards undreamed of in previous practice. Special machines were required for the job, and the Chevrolet plant was the first to acquire and operate the new machinery on a production basis.

How well Chevrolet has succeeded in setting up its plant in a short time, and in attaining a high rate of output immediately, may be summed up briefly in the statement that the limiting factor in the number of complete cars that Chevrolet can produce today is not the supply of knee-action units. In fact, the Detroit spring and axle plant is producing units faster than the final car assembly plants can utilize them—despite the fact that car output recently set a new high record of 4029 in one day, and 33,545 in 15 days. Incidentally, the manufacturing of the new spring suspension units has added greatly to the employment rolls; of the 16,809 workers employed at Detroit by Chevrolet on Feb. 10 (more than double the number of a year ago), several thousand are men work-

THIS is the first detailed account of how Chevrolet makes knee-action units at its gear and axle plant in Detroit. The process by which coil springs are manufactured and the method of fabricating and welding the steel housing for the springs are described. The king-pin support yoke and the steering knuckle are produced by unusually difficult extruding operations. A new application of roller burnishing is used.

ing on jobs created because knee-action manufacture and assembly require many more operations than did the old style leaf-spring assembly.

Chevrolet Knee-Action Design

In the Chevrolet type of independent spring suspension, the entire mechanism, including shock absorbers, is built into a housing that supports the steering knuckle and the front wheel support arm bearings. The housing, with its mechanism, turns (in steering) on the king pin, by which it is attached to the chassis front-end assembly. The wheel is mounted on

its spindle at the end of the support arm, which is attached to a splined shaft which turns on needle bearings within the housing. A short lever on the splined shaft, within the housing, ends in a roller bearing mount carrying a movable spring seat that rests against the lower end of the coil spring. Vertical movement of the wheel at the outer end of the support arm turns the splined shaft against the resistance of the spring pressure on the short lever.

Besides serving as a mounting for the spring mechanism, the housing fulfills two other main purposes—protecting the spring from the weather and from mechanical injury, and providing an air-tight reservoir for the oil that is not only a lubricant but also a hydraulic shock-absorber fluid. In the making of the coil springs, unusual precautions are taken to prevent their being scratched or scarred, since marring of the surface, through localizing the stresses in action, is a source of possible failure. The sturdy housing safeguards the springs from accidental damage that might result from flying stones or workers' tools if the springs were left exposed. In the making of the housing itself, great care is taken to guard against the possibility of leakage. The housing is



A knee-action housing, nearly complete, is shown in the welding machine by which the bearing bosses for the support arm shaft are fixed in the housing. The bosses are aligned and spaced on the shaft of the welder, by which the entire housing is given a complete revolution. As it turns, the housing walls and the bosses are joined by an annular weld completely surrounding the bosses.



Complete front end units, including chassis front cross member, knee-action mechanisms, brakes, brake drums and steering connections, are assembled on this conveyor line for shipping to Chevrolet chassis assembling plants. The line is now working at the rate of 170 complete front-end units every hour, and is operated 22½ hr. a day by three shifts of workers.

given two tests under air pressure—one of the housing alone, as a check on the tightness of the welds, and another of the completed assembly, as a check on the shaft packing and the shock-absorber gaskets.

The housing is made of two stampings from hot-rolled strips of low-carbon steel, 5/32 in. thick. Blanks are punched from the strips, then formed by successive stamping operations.

Two Stampings Form Housing

The housing is formed by butt-welding the two stampings, in a battery of four electric welding machines. Each half is clamped in a fixture, and held firmly against the other under hydraulic pressure to insure close contact during the welding. The housing undergoes its first test under air pressure immediately, to detect any leaks in the welded seams or through the metal itself.

The various machining operations necessary to provide for the assembly of the operating parts in the housing follow. First the top of the cylindrical upper end of the housing is threaded to receive the cover. The steering knuckle forging then is attached by welding to a rectangular projection of the housing wall. Next the support arm shaft bearing bosses are welded into the housing walls, after

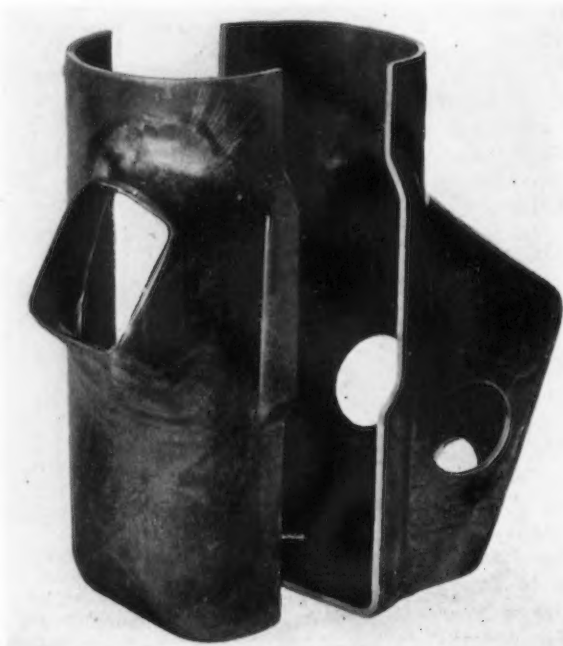
which the housing receives a heat treatment (at the proper temperature) to remove welding strains without decreasing the hardness of the steering knuckle and the bearing bosses. Finally, the bearing holes are sized and smoothed, and the forward face of the housing wall is smoothed to provide a seat for the flanges of the two shock-absorber cylinders.

Chevrolet's specifications for spring

material call for silico-manganese steel of the following analysis: carbon 0.55-0.60, manganese 0.80, phosphorus 0.040 maximum, sulphur 0.050 maximum, and silicon 1.80-2.20 per cent. Tensile strength is 190,000 lb.; elastic limit, 175,000 to 190,000.

As purchased, the steel is in hot-rolled round bars that have been sized to 0.7035 in. by one cold roll. A section of rod cut to 93½ in. and ground smooth to 0.6875 in. diameter, forms a single spring of 10½ to 11 coils. The finished spring, 3 19/32 in. in outside diameter, and 9 11/16 in. high without load, has a compression rate of one inch for each 1520 lb. load. Under a load of 3830 lb., the coils are compressed solid, to a length of 7.2 in. The normal length of the spring in a standing car with curb load (water, oil, gas; no passengers), is 8 in. This represents a load of 2620 lb. on the spring, since the actual sprung weight is increased 3.52 times by the leverage of the support arm. The same ratio applies to spring movement. The total spring travel of 1 15/16 in. represents 6.8 in. of wheel travel.

The first operation in the making of the spring is to reduce the diameter of the bar stock from 0.7035 in. to 0.6875 (11/16) in. on a centerless grinder. The 93½-in. bar then receives a minute inspection. A bar showing nicks or scratches is rejected, because any defect tends to localize the stress to which the spring is subjected in actual operation. The diameter is held to limits of 0.001 in. The ends of the bar are then heated and inserted in a special point-rolling machine, to taper the ends so that they



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In the left-hand half is shown the rectangular projection formed in the stamping to which the steering - knuckle forging is butt-welded. The two opposed openings in the other half are the bearing holes, in which the bearing bosses are welded. Through the bearing hole is seen the opening for one of the two hydraulic shock-absorber cylinders.
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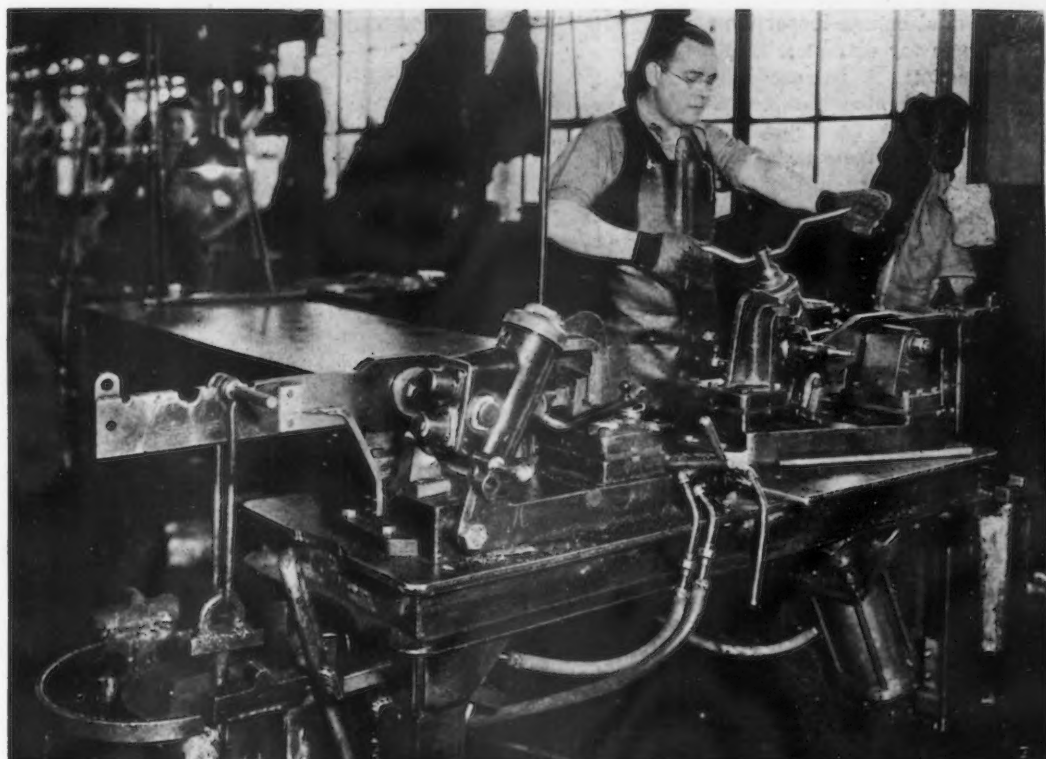
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An assembled unit is clamped in the testing fixture, then actuated under loads equivalent to those in actual use. Full compression of the spring is obtained by pneumatic power added to the leverage of a 700-lb. weight on the lever arm of the testing device. Then the weight alone is used as a load, and the spring setting is corrected until the pointer (at the left of the unit) shows the correct compression. The operator is tightening down on the spring seat to effect this correction.

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will lie snugly against the adjoining coils.

Bars Coiled at 1600 Degrees

Preliminary to coiling, the bars pass through a pusher-type furnace, where they are heated to 1600 deg. F. As they are withdrawn, the red-hot rods are fed directly to the coiling machines, arranged in a battery of four units. One worker inserts the pointed end into the coiler, while another supports the other end in a special handling tool. As the bar is inserted in the machine, jaws grip the tapered point and draw it around a revolving arbor. In front of the arbor is the lead screw, a deeply-cut spiral guide roller, positively driven

at the same speed as the arbor. The rod, running in the grooves of the lead screw, is given the proper feed along the arbor to space the coils correctly. The worker who guides the rod over the lead screw releases his hold as the end is drawn into the coiler, and the last coil is pressed close to the arbor by a heavily loaded roller. The arbor is then withdrawn from the spring by a hydraulic mechanism, and returns to the starting position.

The newly coiled springs are laid in separate cradles of an endless chain conveyor that passes through a furnace for the first step of the heat treatment. At 1600 deg. they are loaded into a 12-sided quenching ma-

chine. Each spring is held to its proper length, and clamped firmly to maintain its shape and diameter, before the descending fixture immerses it in oil for quenching. Except for loading and unloading, the machine is automatic. The coil then goes through a "drawing" heat treatment at 950 deg. to relieve the internal stresses set up by the previous tempering process. After quenching in water, the coil is finally a spring, having been given the temper that insures its elasticity and its ability to withstand repeated compression and shocks without loss of resiliency or change in length. A testing requirement is that the spring must be capable of being compressed 30 times under 5000 lb. with not more than 50 lb. decrease in the pressure exerted when it is compressed to 8 in.

The remaining operations consist of sizing and cleaning the springs. The spring passes twice through a 16-station grinder, each end in turn being ground smooth and flat. This operation reduces the length to 9-11/16 in., and at the same time insures that the ends are parallel to within 0.005 in. This exact parallelism is required to prevent buckling when the spring is in action.

After Brinell tests for hardness, the springs are cleaned in a shot blast, which scours the surface inside and out. The load test follows, the spring being checked for height when compressed solid, for load at 8 in. (2620 lb.), and for rate per in. (1520

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The flange on the forging at the right is formed by a heavy extrusion operation from the forging as it appears at the left. The flange is formed to fit the steel stamping of the front cross-member to which the forging is welded.

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lb.). A final minute inspection checks the springs for diameter, free height and defects. A spring which is scratched or dented is rejected. The finished springs travel by conveyor to be loaded for transportation to the point of assembly in the front end units.

Unique Extruding Operations

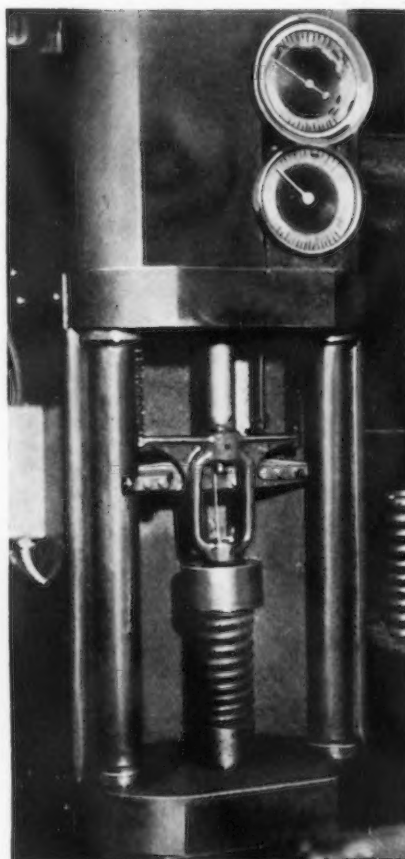
Two unusually difficult extruding operations mark the fabrication in the Chevrolet forge shop, which is the largest in the world in number of hammers and in output, of the king-pin support yoke and the steering knuckle, both made of chrome-nickel steel. The king-pin support yoke is to be welded to a steel stamping forming a part of the front cross-member of the chassis; the steering knuckle is welded to a rectangular projection formed in the stamping of the knee-action housing. For butt welding, it is required that the face of the forgings be flanged to the same thickness (5/32 in.) and to the same contour as the pressed out projections of the stamping.

Chevrolet resorted to an unusual application of the extruding process to produce on the forgings deep flanges to correspond to the pressed steel units. It is believed that this is one of the heaviest extrusion operations in regular use; it is, at any rate, extremely unusual in forge shop practice, in which it commonly is used only for much lighter work. The results have been excellent; the difficulty experienced has been to procure extruding punches that would stand up under the extremely heavy duty required of them.

The part, in each case, is forged from bar steel in a 2500-lb. steam hammer, then hot-trimmed to remove the fins and excess metal. It is then placed in a vertical press. Dies hold it to the proper outside dimensions, while the descending punch, under hydraulic pressure, presses upon the blank, causing the hot metal to flow upward between the dies and the punch, forming the flange. A shoulder on the punch limits the height of the extruded flange, the excess metal being pressed outward between this shoulder and the dies. After hot-trimming to remove the fin of excess metal, the forging is heat-treated and is ready for the machining operations.

Welds Heavily Tested

Severe tests are applied to the welds which join the king-pin support yoke and the steering knuckles to the stampings. The former receives a torsional test, equivalent to the load



Following its heat treatment, the coil is first compressed solid, then to 8 in. as its rate and load are checked on the indicator dials. The springs have a rate of 1520 lb. per in.; when compressed solid, the load is 3830 lb.

of a 200-lb. weight on a 10-ft. radius. The knuckle weld is subjected to a shock test. A similar test is imposed on the two support arm bearing bosses, which are welded to the housing.

Other special knee-action parts made in the forge shop are the front-wheel support arm, which serves as the connecting link between the chassis and the front-wheel spindle, actually supporting the weight of the car; the front-wheel support lever, which operates within the knee-action housing on the same splined shaft to which the support arm is attached, to bear against the movable spring seat; and the knee-action radius rod, mounted parallel with the main support arm, connecting the housing and the brake shoe anchor plate, to prevent the rotation of the brake assembly about the spindle when the brakes are applied. The support arm and radius rod are of chrome-nickel steel; the short support lever is nickel-molybdenum steel. Twenty-four steam hammers and 400 men are constantly engaged in the forging of these and other knee-action parts—an example of the way the adoption of knee-action has boosted employment, since under

the leaf-spring construction of previous models the only part produced in the forge plant was the wheel spindle.

Burnishing Steel Bearing Surfaces

To provide bearings of the utmost smoothness and hardness, Chevrolet has made a new application of roller burnishing. Each knee-action assembly has eight anti-friction bearings of the needle-roller type. By roller burnishing the bearing holes, the surface on which the needles roll is given a polish equivalent to that which would be obtained in actual use in hundreds of miles of car operation.

Roller burnishing commonly has been applied to softer bearing surfaces; Chevrolet believes that this is the first use of the process on hard alloy steel. The bearing holes are diamond-bored and reamed and the roller burnisher applied in a drill press. The rollers not only polish the surface to a mirror-like finish, but accurately size the hole by compressing the metal. The latter effect is a great advantage, of course, since it increases the hardness of the bearing, whereas polishing by the ordinary honing method only smooths the surface, by wearing away the metal, leaving it no harder than before.

ENGINEERING data on hollow set screws and socket head cap screws are given in an eight-page copyrighted booklet published by the Allen Mfg. Co., Hartford, Conn. The set screw data comprise four tables as follows: Proper size relationship between cup point set screw and shaft diameter; recommended inch-pound tightening force; and holding power of cup point set screws on various shaft diameters and on flat surfaces respectively. The tables are based on hardened set screws against a softer metal. The data on cap screws include three tables and one chart. One of the tables gives the recommended tightening force for cap screws of various diameters.

SOME 96 sizes and types of lathes, all of back-gear screw-cutting type, and also a wide variety of attachments, chucks, tools and accessories, are described in the 1934 catalog, 72 pages, issued by the South Bend Lathe Works, South Bend, Ind. The machines range from small bench to large swing lathes, and include tool room, gap bed, cam turning, roll grinding, and brake drum types. Specifications and prices are given.

Distinctive Papers Presented at Mining and Metallurgical Meeting

THE Iron and Steel Division of the American Institute of Mining and Metallurgical Engineers, meeting at New York on Monday, Feb. 19, opened its sessions with a discussion of coal evaluation and the effects of extraneous matter in coal on the physical properties of metallurgical coke. On Tuesday, interest was centered in the theoretical aspects of pure iron, steels and alloys as regards to phase transformations, structures and diffusion taking place during thermal changes.

One study, relative to the Widmanstätten structure, V, dealt with the gamma-alpha transformation in pure iron. Previous work had shown that a maximum of 24 different orientations of alpha phase was possible for each single orientation of the gamma phase, that is, work on quenched steels had shown that the mechanism of formation of alpha iron from austenite in slowly cooled hypoeutectoid steels is such that the (110) planes of the alpha iron form parallel to the (111) planes in the gamma phase, austenite, and that the [111] directions in the (110) planes of the alpha lie parallel to the [110] directions in the (111) planes of the gamma. Whereas the previous work had demonstrated this mechanism for quenched steels, the current study, by Messrs. Mehl and Smith, was an experimental demonstration that the same orientation relationships occur in iron of unusually high purity, thereby proving that the changes inherent in iron are basically responsible for the phase changes in steel.

Reducing Intergranular Corrosion in Chrome-Nickel Steels

The effects of columbium in Cr-Ni steels were discussed by Messrs. Becket and Franks of Union Carbide & Carbon Corp., with emphasis on the desirability of including columbium to about 10 times that of the carbon content, in order to substantially free the 18-8 steels from intergranular attack when exposed to corroding media at temperatures up to 650 deg. C. The damaging effects of intergranular corrosion of austenitic chrome-nickel steels have greatly restricted applica-

THE annual convention of the Mining and Metallurgical Engineers, held at New York last week, was featured by the presentation of an extensive selection of papers by well-informed metallurgists. Metals metallurgy occupied only a small portion of the four-day program, but the sessions of the iron and steel and the metals divisions were nevertheless replete with discussions of interest both to the theorist and the industrialist. This review covers the topics judged to be of particular interest to readers of THE IRON AGE.

tions of the metal, and there is naturally great interest in the various methods of inhibiting or eliminating the effect of corrosive media.

The cause of intergranular corrosion and remedial measures, usually involving the use of additional agents, have been propounded by able investigators both here and abroad. The use of titanium is favored by many as an inhibitor, but the authors presented data showing the value of columbium additions, particularly in a temperature range from 300 to 900 deg. C. It was found that when columbium was present to an extent of at least 10 times the carbon content, the steels were practically free from intergranular attack at temperatures up to about 650 deg. C. It developed, however, that there was some loss in toughness when the steels were held for long periods at high temperatures. A table containing a few of the corrosion tests is shown herein as Fig. 1. At all times, it was found that the columbium additions had no deleterious effect on the physical properties of the steels. In addition, the Cr-Ni-Cb steels are well adapted to welding by either the oxy-acetylene or arc method, and the welds obtained show excellent resistance to corrosion, both in the weld metal and the adjacent zones.

The authors also advanced several interesting observations concerning 18-8 steels containing exceptionally low percentages of carbon, that is,

carbon contents ranging from 0.006 to 0.009 per cent. It was found that, generally, these steels resisted intergranular corrosion at temperatures up to 850 deg. C. There were slight signs of attack with carbon of 0.008, but with carbon of 0.009 per cent no disintegration was perceptible. The Cr-Ni ratio was somewhat different for the two steels, and it was evident that the ratio exercises an extreme influence even in the low-carbon steels. All of these low-carbon steels were noticeably magnetic after quenching from 1150 deg. C.

Visual Observations of Austenite → Martensite

Motion pictures of the austenite-martensite change in steel have been made at a temperature somewhat below 100 deg. C., and a similar phenomenon (A₁ transformation of pure iron) has also been photographed. A paper by Messrs. Knight and Müller-Stock of Pennsylvania State College presented the results of a microscopic study of the formation of martensite from austenite at temperatures from -76 to -150 deg. C.

The suppression of the transformation that can be brought about by additions of alloying elements, such as Mn or Ni, to plain carbon steels has been known since the turn of the century. By the same token, it is possible to lower the A₁ point to sub-room temperatures, and the authors selected steels (such as 0.16 C, 0.27 Mn, 3.91 Si, 0.011 P, 0.021 S, 0.05 Cr, and 24.97 Ni) which were entirely austenitic after brine quenching from 1000 deg. C. These steels gave an abundance of martensite at a liquid air temperature.

The authors found that they could observe the appearance of martensite needles throughout the field of vision. Generally, the transformation occurred below -35 deg. C., and an individual needle formed almost instantly. Several observations disclosed that one end of a needle appeared first and propagated rapidly along the surface until the full grown needle was apparent. The needle formations directly resulted from the cold treatments, and Fig. 2 shows a

photomicrograph of one specimen containing the needles formed after cooling with liquid air. Attempts to secure high-speed photographs were unsuccessful, but the authors hope soon to obtain positive determinations of reaction rates, and thereby to add to the data secured at higher temperatures by the Germans, Hanemann and Wiester.

Changes of physical properties that take place in alloys at elevated temperatures have been carefully determined and publicized. There are, however, numerous reactions between alloys and atmospheric gases, and changes within the alloy itself which have not been investigated. More-

taken progressively toward the center of the sample. On the basis of observed data, no chemical change takes place in silicon iron during heat treatments. It was decided that the film of iron silicate formed on the surface in silicon-rich alloys (over 2 per cent Si) acts as a one-way barrier by preventing the diffusion of oxygen atoms into the alloy, but the film does not inhibit the diffusion of carbon atoms (present in the alloy) to the surface.

The oxygen content of Cr-Ni (18-8) alloys showing piercing defects has been found to be from two to three times that of satisfactory material in an investigation made by Babcock & Wilcox Tube Co. Newell Hamilton,

plete reduction of even the most refractory oxides, but it was found that samples containing aluminum, zirconium, titanium, etc., required longer degasification periods.

The experimental results indicated that oxygen contents of heats exhibiting the checking defect were from two to three times the values obtained on good material, and, more interesting, the oxygen content was roughly proportional to the degree of checking in any one heat. The variation in hydrogen content was within the experimental error, but it was noted that bad heats had hydrogen and nitrogen contents somewhat below the average for heats which showed no checking. The maximum of oxygen content should be 0.01 per cent for good piercing, and the practice of ladle deoxidization with aluminum or zirconium was deplored, as the resulting inclusions often result in splits and tears in hot working that become exaggerated in cold drawing. It has been suspected that oxygen probably is in unstable combination with chromium. The formation of an oxygen-bearing constituent at elevated temperatures having physical properties differing from the alloy matrix was considered, but microscopic examination at room temperature has so far failed to detect such a constituent.

Numerous Papers Presented to Metals Division

The presentation of papers in the metals division occupied most of Tuesday, Wednesday and Thursday. The range of subjects was such as to include the most important phases of the industry. The round-table discussion on non-ferrous metals in the electrical industry on Thursday included the usefulness of non-ferrous castings in electrical apparatus and equipment, and a complete resume of the electrical and economic advantages of various types of conductors.

Data on a reliable test of the drawing properties of rolled zinc alloys were given by Messrs. Kelton and Edmunds of the New Jersey Zinc Co. Zinc-base alloys, with their wide range of effective rolling treatments, are finding increasingly wide application for making drawn articles. Neither scleroscope hardness nor temper, nor even the dynamic ductility test (A.S.T.M. B 69-29) serve as reliable indexes of good drawing properties. In order to introduce a quick and reliable test of drawing quality, the authors presented information concerning the use of adjustable cut-and-draw tools.

Fig. 3 shows a section of the so-called "combination" cut-and-draw

Approximate Temperatures Within Range 300 to 850 deg. C. that Cause Subsequent Disintegration in Boiling Acidified

Cr, Per Cent	Ni, Per Cent	Cb, Per Cent	C, Per Cent	Copper Sulphate, Degrees Centigrade
18.39	8.39	0.37	0.14	475 to 650
18.49	8.56	0.44	0.10	550 to 650
18.28	9.42	0.51	0.07	550
18.36	9.38	0.79	0.13	650
18.33	9.16	1.51	0.18	550
18.75	9.02	1.00	0.11	650
17.81	9.18	0.75	0.07	None found
18.63	9.27	1.25	0.12	None found
18.75	9.14	2.13	0.12	None found
22.87	12.43	1.50	0.14	None found
26.06	20.44	1.51	0.14	None found

Fig. 1—Corrosion tests on Cr-Ni steels containing columbium. All samples are quenched from 1150 deg. C. before testing, and contain normal amounts of manganese, silicon, phosphorus, and sulphur. When columbium content is about four times carbon, the range of attack is diminished, and when Cb is ten times C content, the steels fail to disintegrate at the grain boundaries after exposure for long periods at temperatures up to 850 deg. C.

over, most of this type of work has been performed on heat-resisting alloys. A paper by N. A. Ziegler, Westinghouse Research Laboratory, Pittsburgh, was primarily devoted to iron-silicon (transformer material) alloys, with considerable attention devoted to possible silicon impoverishment of alloys due to surface oxidation of silicon during annealing in oxidizing atmospheres. There was also considered the possibility that Fe-Si alloys may behave like "pure" iron, inasmuch as oxygen saturation may occur through direct diffusion of oxygen into the alloy, or oxygen combining with silicon to form Si O₂ or more complicated (silicate) inclusions. The results obtained by Mr. Ziegler were, as a whole, negative in character.

In performing the experiments, attention was concentrated on the behavior of Si and C in silicon iron during annealing in different atmospheres. Samples were prepared and carefully analyzed for chemical homogeneity. Annealing was carried out in air, vacuum, hydrogen and oxygen, and analyses were then made of the scale and of various cuts 1/16 in. thick

research metallurgist of the company, presented a paper on this subject, which included a correlation of hydrogen and nitrogen contents of steels having good and bad tube-piercing qualities. The samples were selected over a six-year period of plant operation.

The most deplorable defect was called "outside checking," and consisted of outside transverse cracks originating at the piercing mill. After plug rolling these cracks opened and varied in depth from 0.001 in. to complete rupture. In all cases, the samples selected for analyses had all possibility of mill (piercing) variables eliminated.

The degasification and analyzing apparatus was basically that of Jordan and Eckman (Bur. Standards) with certain refinements to give complete reduction of oxides, higher evacuation rates, and minimization of gas evolution from refractories. Particular attention was devoted to the reproducibility of results, and the data indicated reproducibility within 0.0005 per cent oxygen. Generally, this vacuum fusion method gave com-

tools, in which the drawing take-in was increased as much as possible. The punches were turned from 1.20 to 1.30 C steels to within 0.020 in. of the final diameter (about 1.5 in.). They were then hardened and tempered, ground, and polished to the final diameter. Drawing ends were tapered 0.001 in. in the last 1.25 in. to facilitate stripping the cup. Punch radii were chosen to give the best drawing results for each particular thickness of metals—metal 0.012 to 0.016-in., radius 3/32 in.; metal 0.018 to 0.022 in., radius 7/64 in.; metal 0.024 to 0.040 in., radius 9/64 in. After experimentation, a standard clearance between punch and die of exactly the original metal thickness was adopted. Finishing operations for the draw dies were similar to the punched, with considerable leeway permissible in the choice of the best radius for any particular metal thickness.

Drawing tests were then performed on a series of blanks at room temperature. By drawing blanks of various sizes, and by following the arbitrary rating of successful draws, complete failures, or "necking" failures, demonstrated by the authors, an excellent comparison of rolling and annealing treatments is secured. For one particular alloy, the authors found that maximum drawing quality was not realized with either the softest metal or the metal having the highest dynamic ductility. In conclusion, the authors contended that this method was the most economical and dependable for determining the drawing quality of alloys.

The development of oriented structures in zinc as a result a systematic series of rolling treatments was analyzed in a paper presented by Messrs. Fuller and Edmunds of the

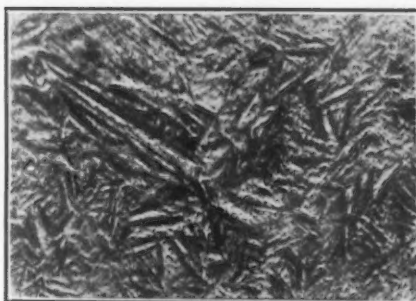


Fig 2—Martensite needles formed in steel during cooling with liquid air. The structure is shown without etching at a magnification of 150 diameters.

New Jersey Zinc Co. Deformation of zinc occurring primarily through slip along basal planes [00.1], and secondary through twinning on pyramidal planes of the form [10.2] had been previously described by several eminent investigators. The authors, however, go further by examining orientation changes produced by successively increasing degrees of cold rolling reduction.

The orientation structures were determined by an X-ray method previously developed by the author (Trans. A.I.M.E. (1932) 99, 75), and the pole figures were presented diagrammatically for the more important basal plane [00.1] of an alloy (1.0 Cu, 0.01 Mn). It was found that cold rolling yields three types of preferred orientation. One type, not previously reported in literature, discloses the principal axes of the crystals as approximately parallel to the rolling direction. The structures are rationalized in terms of the mechanisms of deformation of zinc crystals, basal slip and pyramidal twinning, and the changes of form undergone by the metal during rolling.

As the solubility of gold in iron at

various temperatures is of considerable importance in connection with the working of alloys in the manufacture of certain "gray" and "blue" golds, the report of several Columbia University workers on the solid solubility limits below the alpha-gamma transformation point of iron attracted considerable attention. The data in this range of temperature established the fact that only the two limiting solid-solution phases occur, and the limits of these solutions were determined at several temperatures. The experiments also showed that the precipitation hardening of alloys high in gold content is possible.

As previously indicated, the Fe-Au system consists of two terminal solid-solution ranges with a two-phase area in between, and no indication of a compound of the two elements. Lattice constants were determined to within an error limit of ± 0.001 A. Inspection showed that gold increases the iron lattice very slightly (iron-rich phase), indicating the solubility of gold in iron is low, and solubility limits were found to be lower than those reported by previous investigators. At 400 deg. C. it was found that solubilities were 0.5 Au and 5.9 Fe in weight per cent. The alloys are diamagnetic up to 0.1 weight per cent Fe, above which they become paramagnetic. The authors also demonstrated that the ferromagnetism of alloys (10 to 15 weight per cent Fe) first noted by Shih, is a property of the gold-rich phase.

Other investigators at Columbia University discussed the results of recent X-ray studies on the Ni-Cr system. These alloys form the base for many industrial heating alloys, so any positive determination of the system's characteristics is of considerable

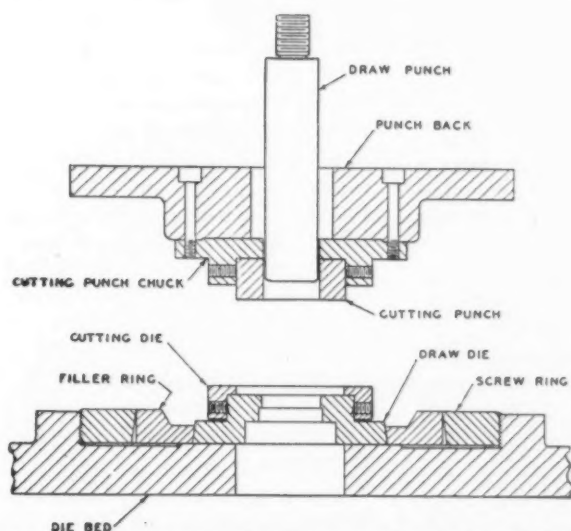


Fig. 3—Sectional view of combination cut-and-draw tools to secure dependable indexes of drawing properties of rolled zinc alloys. Construction and operation is discussed in the text.

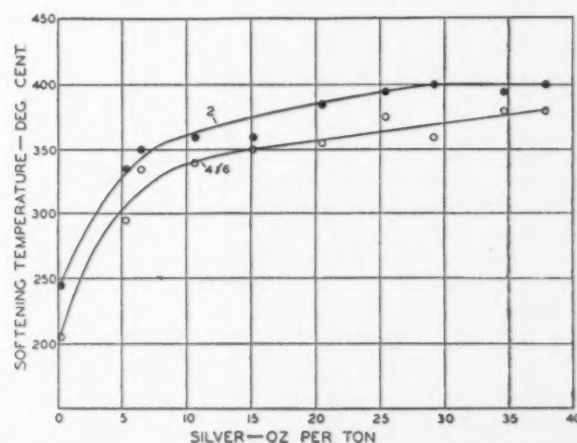


Fig. 4—Influence of silver on softening temperature of copper sheet rolled 2, 4 and 6 B. & S. numbers hard. Numbers on curves refer to reduction in gage. As much as 40 oz. of Ag (0.14 per cent) per ton has no adverse effect on the mechanical properties, nor does it lower the electrical conductivity by more than 1 per cent.

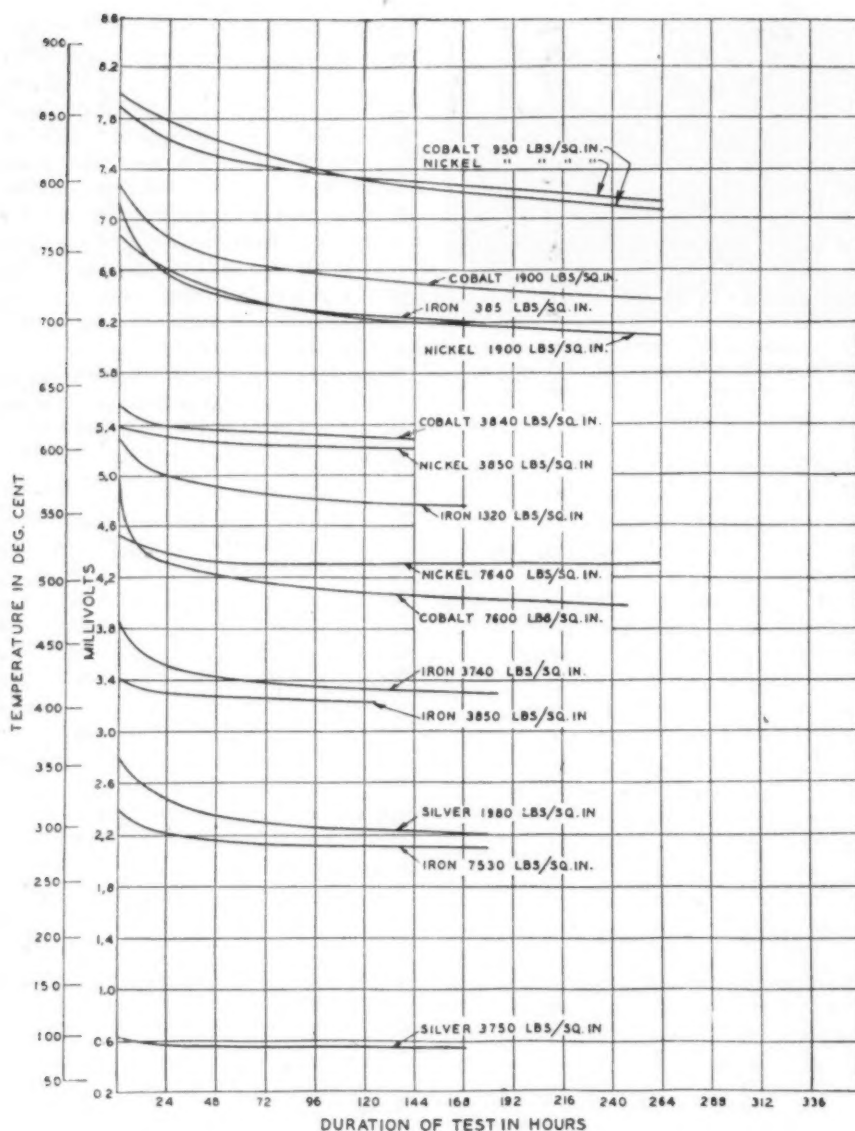


Fig. 5—Creep tests on pure metals. Millivolt ordinates are also shown as equivalent temperatures. These data provide a definite measure of the capability of a metal in terms of load carrying capacity for any given temperature, or in terms of temperature to which the metal may be raised and beyond which it fails to provide a given load carrying capacity. A modified Rohn test was used to secure the data.

practical importance. It was shown that at temperatures below 1150 deg. C. the system consists of two terminal solid solutions with an intervening two-phase area. No structures were found other than body-centered Cr lattice, face-centered Ni lattice, and occasionally a rhombohedral structure of Cr_2O_3 which has been isolated as an inclusion. The solubility of Ni in Cr is low on the Cr side of the system, but distinct increases were noted above 900 deg. C., and the increases proceeded rapidly but fairly uniformly with temperature increases. The solubility at 1113 deg. C. was found to be nearly 53 weight per cent Cr., which is beyond the eutectic point as determined by thermal analysis.

That the annealing or softening temperature of cold-worked copper is

appreciably increased by almost unbelievably small amounts of silver has been known since 1916, but a paper of three Columbia investigators presented definite data covering the problems. Silver-bearing copper finds considerable use in industry as it retains its strength in operations involving soldering or tinning and the results are consequently important.

The annealing or softening temperatures of copper sheet cold rolled 2, 4, and 6 B. & S. gage numbers (20, 37 and 50 per cent thickness reduction) are shown in Fig. 4. Softening was measured by means of Rockwell hardness tests, and the "softening temperature" was designated as the point where hardness dropped suddenly. As the curves indicate, there is no detectable difference in the softening temperature of the material

rolled four numbers or six numbers hard, but the softening temperature of the material rolled two numbers hard is 30 deg. C. higher than that of the more severely cold-worked materials.

As shown by Fig. 4, the softening temperature increases rapidly until the Ag content reaches 10 oz. per ton (0.034 per cent), and then slowly with further increase in Ag content. The silver is effective in raising the softening temperature of high-conductivity, tough-pitch, cold-worked material for very short anneals and also for heating times of months. Cold-worked Cu containing almost no Ag is completely softened on heating for a few days at 150 deg. C., whereas copper of the same hardness containing 10 oz. Ag per ton is not greatly softened when maintained at this temperature for a year.

The practice of adding moderate quantities of Ni to a variety of bronzes has been employed for years by founders in order to harden the alloy, to increase the fluidity, to improve the solidity, or to refine the grain of castings. The possibility of reducing the cost of bronze by replacing a portion of the Sn with Ni has received considerable attention, and a paper by Messrs. Wise and Eash, of International Nickel Co., discussed the strength and aging characteristics of nickel bronzes.

The alloys considered ranged from 0 to 12.5 per cent Sn and from 0 to 15 per cent Ni, together with numerous alloys containing both Sn and Ni. It was shown that the presence of Ni leads to improved tensile properties and decreased cost. The properties of sand cast alloys of constant cost (88-10-2 alloy) were found to be best with Sn of 5 per cent and Ni of 8 per cent. The aging characteristics are presented, and data regarding physical properties of annealed and aged sand cast alloys show that tensile strengths in excess of 90,000 lb. per sq. in. with 15 per cent elongation are obtainable. The fatigue strength of 7.5 Ni and 8 Sn alloy was found to be about 18,000 lb. per sq. in. at 16,000,000 cycles. These relatively inexpensive alloys can have tensile strengths of the order of 135,000 lb. per sq. in. for annealed and aged alloys, and 170,000 lb. per sq. in. for hard-rolled and aged alloys. The practical considerations dictating the use of nickel bronzes also were briefly considered.

The evaluation of commercial alloys for high-temperature service is a problem which has received much attention. A paper presented by

Messrs. Austin and Gier, of Westinghouse Electric & Mfg. Co., extended previous work to Ni, Co, and several widely used commercial alloys as regards to plastic deformation in decreasing creep rate. In preference to tensile proportional limit, and "bend" tests, a modification of the Rohn test was employed, as previous results had indicated that it gave a more reliable criterion for creep characteristics.

The Rohn test is based primarily on the supposition that there is a suitable linking between the deformation by stretching under constant load and the temperature of the specimen, and

if the test is conducted for an indefinite period, a limiting condition is approached where the temperature of the test rod has been progressively reduced to a point at which it is capable of sustaining the load without accepting further measurable deformation.

In Fig. 5 there is assembled a group of curves for Fe, Ni, Co and Au, illustrating the time-temperature relationship under different loads. The data thus available are a test in differentiating between metals or alloys with respect to their high-temperature strength. Comparing Fe and Au, it

can be seen that Au, with a load of 2000 lb. per sq. in., and Fe, with 7500 lb. per sq. in., tend to approach a limiting temperature assumed to be near 275 deg. C.

A considerable amount of data was also presented by the authors on creep characteristics of several well known alloys. A convenient means of classification was discussed, whereby an approximate relationship is expressed between load-carrying capacity and temperature for any given metal. In addition, the effects of minute amounts of plastic deformation on resistance to further creep were shown.

Mining and Metallurgical Society Meets in New York

PAPERS on ferrous and non-ferrous metallurgy, with the attendance of national technologists who are making history in the field, featured in part the 143rd meeting of the American Institute of Mining and Metallurgical Engineers held in New York last week. There were sessions devoted to mining and ore preparation, including coal industry problems, meetings on petroleum, non-metallic minerals and geology, discussions of the use of airplanes in mining and petroleum operations and special attention to mineral dust hazards—those which have brought into industry the word silicosis. In connection with the last named subject there was an exhibit of apparatus for investigating lung conditions, with arrangements for taking X-ray pictures of members who had been exposed to mineral dust hazards and could supply their case histories.

Honorary membership was conferred upon Karl Eilers and Dr. Albert Sauveur. Mr. Eilers, who has been treasurer of the institute for the last seven years, has been in independent consulting practice in New York since 1920, when he resigned as vice-president of the American Smelting & Refining Co., with which he had been identified since its formation in 1899. Doctor Sauveur, who has been the recipient of numerous honors in the United States and abroad, has been a teacher of metallurgy and metallography at Harvard since 1897.

Dr. Pope Yeatman, engaged in private consulting practice in New York, was awarded the William Lawrence Saunders medal for "distinguished achievement in mining." From 1906 to 1916, he was connected with the Guggenheim interests, with responsibility for copper mining developments at Ely, Nev., at Braden and Chuquibambilla in Chile and the Kennecott mines in Alaska.

Dr. Cyril S. Smith, in charge of the copper alloys research laboratory of the American Brass Co., at Waterbury, Conn., and Earl W. Palmer, who is associated with Dr. Smith, received the Robert W. Hunt prize awarded for a paper of high merit on iron and steel. Their paper, presented a year ago, was devoted to the "Precipitation-Hardening of Copper Steels."

Benjamin J. Harlan, superintendent of blast furnaces for the Bethlehem Steel Co. at Lackawanna, N. Y., was given the J. E. Johnson, Jr., award for "exceptionally meritorious work in the study of the qualities of sintered product and the use of that material in high percentages in the operation of a blast furnace with remarkably successful results."

The institute has 76 living members who have been on its rolls for fifty years or more, this total having been reached by the addition of 17 announced at the annual dinner, Feb. 21, when all the honors here mentioned were formally conferred.

Officers Elected

Howard N. Eavenson, Eavenson, Alford & Hicks, Pittsburgh, was elected president for the ensuing year. Louis S. Cates, president, Phelps Dodge Corp., New York, and Karl Eilers, consulting engineer, New York, were elected vice-presidents. The following were made directors for three years: H. A. Buehler, State geologist at Rollo, Mo.; Charles B. Murray, Crowell & Murray, Inc., Cleveland; Brent N. Rickard, El Paso Smelting Works, El Paso, Tex.; Dr. George B. Waterhouse, professor of metallurgy, Massachusetts Institute of Technology, Cambridge, Mass., and William Wraith, Inspiration Consolidated Copper Co., New York.

An imposing array of papers marked the meeting as usual, and in addition

there was the Henry M. Howe Memorial Lecture, which has come to be a feature of the sessions of the iron and steel division of the institute. Nomination to deliver the lecture is another honor bestowed by the institute, and this year the designate was Dr. F. N. Speller, chief of the department of metallurgy and research of the National Tube Co., whose contribution was a monumental treatment of the corrosion problem.

Previous to the Howe lecture, Dr. T. T. Read, professor of mining engineering, Columbia University, New York, delivered an illustrated lecture that was convincing that the Chinese were adept in the art of making iron castings, perhaps as early as 200 B. C., whereas it has been too widely believed that cast iron was a German invention of about the fourteenth century. Pictures were reproduced of ancient statues, some of heroic size, which came into being up and down the centuries prior to the Middle Ages. He also showed shallow brine evaporating pans of iron and also of coins of iron of early manufacture. Professor Read's studies indicate that many of these castings are high in phosphorus, as much as 7 or 8 per cent, which brought about low melting temperatures.

The Institute of Metals Division Lecture, likewise a noteworthy event of the meeting, was presented this year by Prof. L. W. McKeehan, director of the Sloane Physics Laboratory, Yale University, New Haven. His subject was: "Ferromagnetism in Metallic Crystals."

A list of the presiding officers of the iron and steel division meetings included the following: F. B. Richards, Ralph H. Sweetser, Dr. M. A. Grossmann, F. B. Foley, Prof. H. M. Boylston, V. N. Krivobok, Dr. F. N. Speller, Jerome Strauss, Dr. John Johnston, Dr. George B. Waterhouse, Dr. F. M. Becket, L. F. Reinartz and Clyde Williams.

Elsewhere in this issue are reviewed some of the papers read before the metallurgical sessions. Others will be presented in these columns at the earliest opportunity.



Contracts Under the

ALTHOUGH the Code of Fair Competition of the Iron and Steel Industry has been in operation for more than six months, the matter of contracts is still one of its most confusing features.

The change from a pre-code form of steel contract, which was little more than an option running in favor of the buyer, to a type of commitment under which the buyer accepts a definite obligation and responsibility, was perhaps too drastic for quick adjustment of old buying habits.

While it is true that the rigidity of the contract regulations, as at first promulgated, has been modified somewhat, the new set-up is nevertheless much more stringent than the old-time methods.

Three Types of Contracts

Aside from making the terms of contracts enforceable on buyers as well as sellers, the chief change introduced by the code is the general provision that contracts shall not extend beyond a calendar quarter. There is nothing in the code or in the regulations and commercial resolutions amplifying that instrument that stipulates the form of contract that shall be used. However, three types of contract have been widely adopted to govern business with manufacturing and jobbing users of steel. They are as follows:

1. A contract for a definite tonnage for a quarterly period, which gives the buyer the privilege of specifying at any time during the contract period, provided the seller is given ample time to make shipment by the last day of the quarter. In making such a contract the customer obligates himself to take out the tonnage stipulated.

2. A contract with a minimum and maximum tonnage, the maximum not to be greater than 25 per cent above the minimum in amounts over 100 tons. Under this form of contract the customer will be required to order out the tonnage in approximately equal monthly quantities, but complete shipment must be made by the last day of the quarter. In this form of contract the minimum amount represents the tonnage the customer is obligated to take and the maximum amount of tonnage represents the maximum the seller is obligated to accept. Contracts for 100 tons or less should be made preferably under class 1. If made under class 2, the leeway between the minimum and the maximum is left to the judgment of the seller. Definite tonnage contracts are not widely used because buyers find it difficult to estimate their exact needs for an entire quarter.

3. A contract for a definite stated percentage of customer's requirements, with a maximum stated tonnage. This contract is to be specified in maximum monthly quantities so that not more than one-third of the maximum requirements for the quarter will be called for in any one month of the quarter. Under this form of contract the buyer assumes no obligation except to give the individual mill the proportion of his purchases indicated in the contract. This may be 100 per cent or any part of that amount. Complete shipment, however, must be made by the end of the quarter.

The percentage type of contract led to some confusion in the fourth quarter among purchasing agents who had spread out their business among too many suppliers. These buyers, in some cases, encountered difficulty in dividing small tonnages without incurring less-than-carload freight charges and quantity differentials. An extreme case heard of was a purchasing agent who divided his contracts for one product among 10 mills. However, there are few buyers who use more than two or three sources for a given product. The majority of buyers favor the percentage form of contract and a large proportion of the commitments of the mills for the current quarter are of that type.

Contracts Rigid

Once a contract for steel has been signed by both parties, nothing therein can be changed. This has been definitely ruled by counsel for the American Iron and Steel Institute. The point was raised by steel consumers last October when the freight rate surcharges were removed. Buyers thought they would get the benefit of the rate reductions as a matter of course, but in the case of code contracts this could not be done unless allowance for the surcharges had previously been made in the terms of sale. This was due to the fact that all code contracts are made on a delivered price basis, with all-rail freight included. Where mills or buyers foresaw the removal of the surcharge, it was omitted from the delivered prices carried in the contracts, thereby forestalling any dispute. And in the case of pre-code contracts that were still in force there was likewise no difficulty, since the mills could follow the former practice of giving buyers the benefit of freight rate reductions.

While the inflexibility of code

prices worked to the disadvantage of certain buyers on this occasion, it may have the opposite effect at some future time. Under pre-code conditions, buyers were credited with freight rate reductions and were likewise expected to pay any increase. Under the code, unless contracts specifically provide for a forthcoming rate cut, buyers are given no allowance on a rate reduction, but they do benefit to the extent of any rate advance that may be made. In other words, since the delivered prices in contracts cannot be changed under the code, mills must assume the burden of any increases in rates.

No little friction and misunderstanding grew out of the refusal of steel companies to deduct the freight surcharges that expired last October, but the staunch attitude of the industry did a great deal to establish the integrity of steel contracts in the minds of buyers.

Difficulties in the Fourth Quarter

The code stipulation banning the extension of contracts beyond a calendar quarter led to difficulties in the fourth quarter of 1933. Although the mills, in accordance with the code, insisted that all specifications be submitted in time to permit rolling and shipment by Dec. 31, some buyers did not allow sufficient time for the fulfilling of this requirement, with the result that a considerable number of December specifications were declined by the mills on the ground that shipments could not be completed before the deadline date. While it was not easy sailing for the mills to enforce this regulation view of their traditional leniency in such matters, the differences were as a rule adjusted amicably, and not a few orders were reinstated for first quarter shipment at the prices prevailing for this three-months' period.

The contract provision of the code, however, has brought about considerable discussion as to the advisability of ameliorating the terms so that buyers may specify up to and including the final day of a quarter, with shipments to be made at the mills' earliest convenience. The bolt and nut industry, for example, which is not yet under code regulation, permits specifications up to the last day of a quarter, but requires that shipments shall be com-

Steel Code

pleted within 15 days thereafter, if the condition of order books will allow. A change of this sort, however, could not be made without amending the code. And if such an amendment were adopted the result would be to postpone the deadline date without necessarily preventing delayed specifying.

The code provision relating to completion of contracts within the quarter has ample justification. It was necessary to remedy one of the oldest evils of the industry, namely the rush of specifications that nearly always occurred on the eve of a price advance, as a result of which the mills were prevented from deriving the benefit of such an advance for a considerable period, sometimes for months.

A repetition of the tension that developed in the fourth quarter of 1933 is improbable. During that period consumers did not fully appreciate the hard and fast character of contract terms under the code. Moreover, in certain products there was a large accumulation of low-priced commitments, some of them at pre-code terms—a condition that is not likely to confront the industry in the future.

Code Obligations vs. Obligations to Buyers

The code limitation on contract shipments places a responsibility on mills to give customers ample notice of the date when final specifications must be received. Some contracts definitely name a final date for the receipt of releases, but even in such cases mills must be careful not to commit themselves beyond their capacity to produce and ship. In other words, mills have a double contract obligation to consider, first their obligation to the customer to ship the steel ordered, and second their obligation under the code not to make shipments after the expiration of a calendar quarter. In cases where mills have not notified their customers when final specifications must be filed or have notified them too late for full shipments to be made, it is doubtful whether unshipped tonnages can be canceled without making the producers liable to the customers for damages. Similarly when the final specification date is contained in the contract, failure to deliver would lay the mill open to a damage suit. In other words, by escaping penalties under the code for shipping beyond the end of

the quarter, the mill would lay itself open to damage suits by buyers.

In instances where unforeseen and unavoidable circumstances, such as strikes, floods, fires and earthquakes, prevent complete shipments against a contract, it would seem that both mill and customer would have a right to ask for a special dispensation allowing an extension of shipments. It is not clear, however, just what steps should be taken in an exceptional case of this sort. Obviously a formal request would have to be filed for the consideration of the board of directors of the American Iron and Steel Institute and it is probable that any action taken on the application would be under the so-called life-saving clause—Section 6, Article X. This clause reads:

Section 6.—Anything in the code to the contrary notwithstanding, the board of directors by the affirmative vote of two-thirds of the whole board may waive any liability for liquidated damages imposed by or pursuant to any provision of the code for any violation of any provision thereof, if in its discretion it shall decide that such violation was innocently made and that the collection of such damages will not to any material extent tend to effectuate the policy of Title I of the National Industrial Recovery Act.

It will be noted that this section authorizes the waiving of damages for past acts but does not grant amnesty before those acts have been committed. In other words, a mill must violate the code and lay itself open to penalties before it can ask that an exception be made because of extenuating circumstances.

Exceptions to Contract Provision

While the quarterly contract period applies to the general run of manufacturers and jobbers, there are, as is probably now well known to the majority of buyers, certain well defined exceptions. Under Section 4 of Schedule E of the code, the existence of an uncompleted contract for 20 per cent or more of the total quantity of a given product sold in this country gives all mills the privilege of selling at equally favorable prices and terms. So far as is known, there is only one long-term contract of this type, a contract between a large producer of tin plate and a large manufacturer of tin cans. This contract was not abrogated by the code and hence replaces the code as a determinant of selling policy during the remainder of its life. The peculiar re-

THE iron and steel code has made contracts as binding on the buyer as on the seller. The imposition of this new obligation on the purchaser has created a widespread demand for information on different phases of the subject of contract relationships under the code. This article was prepared to satisfy that demand. It is the outcome of the joint efforts of several students of the code and is believed to embody the best available interpretations of the subject.

quirements of the canning business are reflected in this contract, which permits the buyer to purchase for a nine months' period as contrasted with the three-month period that now rules on most other forms of steel.

Other notable exceptions to the quarterly contracting limitation derive their authority from Schedule E, Section 9, of the code, which states: "*Except in the case of a product required by a purchaser for a specified definite contract of such purchaser with a third party at a fixed price, none of the members of the code shall make any contract of sale of any product by the terms of which the shipment of such product is not required to be completed before the end of the calendar quarter-year ending not more than four months after the date of the making of such contract.*"

Under this clause Commercial Resolution No. 33 authorizes six-months' contracts on rails and track accessories purchased by railroads with the proviso, however, that any such contracts entered into prior to March 1, 1934, shall be completed by June 30 of this year. This resolution was adopted in order to facilitate the recovery program of the Federal Administration and particularly that portion fostered by the Federal coordinator of railroads.

Contracts for Identified Structures

The above-mentioned exceptions to the general provision for quarterly contracts are quite well understood by all of the parties concerned, and their effectiveness has not been impaired by the difficulties of interpretation that have beset some other features of the code. The exception that has perhaps caused the greatest amount of discussion among both buyers and sellers is that covered by Commercial Resolutions Nos. 22 and 34, which permit the mills to make contracts for steel for identified construction, under certain specified conditions, for the "life of the job."

As generally construed by the steel companies, Schedule E, Section 9, from

which Commercial Resolutions 22 and 34 derive their authority, applies only to specific construction projects, such as buildings, bridges, highways, ships, pipe lines, etc., and also railroad cars and locomotives when financed under the Federal recovery program.

Some manufacturing users of steel have attempted to construe this provision as applying to any definite third-party contract even for such products as machinery, automobile parts, etc. The addition of railroad cars and locomotives to the list of acceptable construction projects coming within the scope of Commercial Resolutions Nos. 22 and 34 was perhaps not originally in the minds of the framers of the code, but all steel companies have now accepted this expansion of the list.

This does not mean, however, that the door is wide open to the making of contracts for a period greater than three months for all types of third-party arrangements. The steel companies are attempting to apply the rule of reason to this provision, but they point to the confusion that would result if every manufacturer of equipment who makes a third-party contract for extended delivery were to be permitted to contract for the steel beyond the limits of the calendar quarter-year. Some interesting questions have arisen under this clause, and any unusual case probably will be decided on its merits.

Under Commercial Resolutions Nos. 22 and 34, the steel mills are permitted to quote a "protection price" to any bidder on a construction project. This "protection" is held open until the contract for which the material is wanted has been formally awarded; but, if an advance in the price of that particular steel product has occurred while this "protection" is still open, then a further period of only 60 days is allowed, during which time the contractor must sign a formal contract for the steel. Once this contract has been signed, it remains good until the particular project for which it has been purchased has been completed. If the contract sale has been made at a base price, the extras (or deductions) in effect at the contract date would apply, regardless of the date of final shipment and regardless of changes in extras that might have been made in the meantime. This is a reversal of old-time practice, wherein contractors not infrequently demanded—and usually obtained—any advantage from changes in base prices or extras during the life of the contract.

Commercial Resolutions Nos. 22 and 34 apply only to "identified construction projects." This means that every bidder on construction projects must

furnish the steel mill with the name of the job when he applies for a "life of the job" quotation. Some contractors have declined to do this on the ground that it entails an endless amount of detail work, much of which will ultimately prove to have been useless, because the average bidder obtains only a small percentage of the jobs on which he bids. However, the mills have no option in the matter and are insisting that such information be filed with every request for price protection.

Even with the utmost watchfulness, the mills probably will have difficulty in preventing buyers of steel for construction projects from abusing their privileges under Resolutions Nos. 22 and 34. The mill is usually obliged to accept the estimate of the contractor as to the amount of steel that will be required for a particular job. In a rising market the contractor will be tempted to make liberal estimates of his needs and it may be difficult to ascertain whether the entire tonnage specified actually goes into the job for which it was ordered. While overspecifying may be difficult to trace when the excess is small, any flagrant abuses would no doubt be discovered. For example, when a fabricator is ordering structural steel for a particular job he orders most of his material cut to length. Excessive orders for mill lengths would be an immediate cause for suspicion.

While the code does not specifically deal with cases of this sort, it is obvious that they would be immediately judged as unfair practices tending to defeat the purpose of the code, under the provisions of Section M of Schedule H. And it is the mill's responsibility to prevent abuses of this sort. Proof of infractions of the terms of Resolutions Nos. 22 or 34 convicts the seller of violation of the code and makes him liable to penalty.

The above discussion has been confined to steel. Regulations pertaining to pig iron are similar, except that, in keeping with past practice, there is no buyer's option as to form of contract. Only one form of pig iron contract prevails, namely one that specifies a definite amount which must be shipped within the calendar quarter-year. There are no leeway or "percentage of requirements" types of contracts for pig iron. The amount contracted for must be taken out; if for any reason a buyer could not do so his only recourse would be to sign a new contract in the ensuing quarter for any unshipped portion of his contract at the price in effect for that period.

Cancellation of Contracts

This brings us to a moot question of code practice with regard to the cancellation of contracts. Schedule H,

paragraph E, lists as an unfair practice the cancellation of "any contract of sale" except for a "fair consideration." When prices and extras are unchanged a new contract covering a quantity identical with the amount unshipped is sometimes accepted as constituting a fair consideration, but it is not certain that it would be so judged by a jury if the matter were taken into court. If prices have advanced a new contract at the higher prices is frequently accepted as constituting a fair consideration. If prices or extras should be revised downward, a new contract would be deemed a fair consideration only if it were closed at the terms that prevailed in the canceled instrument.

From a legal standpoint there is nothing new in the "fair consideration" provision. At law a mill could recover damages to the amount of the unspecified tonnage in a contract with the possible deduction of such monetary advantage as the court might consider the mill derived from being freed of the responsibility of carrying out its part of the agreement. At times in the past producers have sued for and recovered damages for non-fulfillment of contract obligations. This was particularly true in connection with the export contracts in the years immediately following the war. But, as a rule, mills have not, in the past, taken these matters into court, and, as a consequence, have permitted contracts to degenerate into mere options—binding on the producers but not on buyers. It is this one-sided relationship that the code seeks to correct.

The provision that extras prevailing at the time a contract is signed shall continue to rule through the life of the agreement, regardless of revisions that may be made in the interim, likewise is not new. However, in this case also, enforcement was uncommon when extras were reduced.

Desire to Correct Maladjustments

All in all, the new contract features put into force by the code have worked reasonably well. There are complaints, of course, but they are chiefly those which can readily be adjusted. One common complaint of manufacturing steel consumers is that their contracts with their own customers frequently run for six months or longer, whereas they can cover on steel only for three months. This and all other complaints are receiving the attentive consideration of the commercial committee of the American Iron and Steel Institute, whose record of nearly 50 commercial resolutions and three regulations illustrates its desire to correct any features of the code which seem to be unduly oppressive on any class of buyers.

Introduces Internal Centerless Grinder



THE principles of centerless grinding have now been applied to internal grinding, a machine for this work having been announced recently by the Heald Machine Co., Worcester, Mass.

This epochal machine tool, development of which is credited to the combined efforts of engineers of the General Motors Corp., the Cincinnati Milling Machine Co. and Cincinnati Grinders, Inc., and of the Heald company, is entirely automatic both as to the loading and the grinding cycles. Furthermore, the size of the finished bore may be held automatically within very close tolerances by either the Gage-Matic or Size-Matic methods.

Straight, tapered, continuous, interrupted, open or blind holes in parts having finished cylindrical outer surfaces up to 3 in. diameter by 3 in. long can be ground. The minimum recommended diameter of holes is $\frac{1}{4}$ in. Maximum included angle of taper on the Size-Matic equipped machine is 30 deg.

Except for the centerless method of holding the work and the automatic

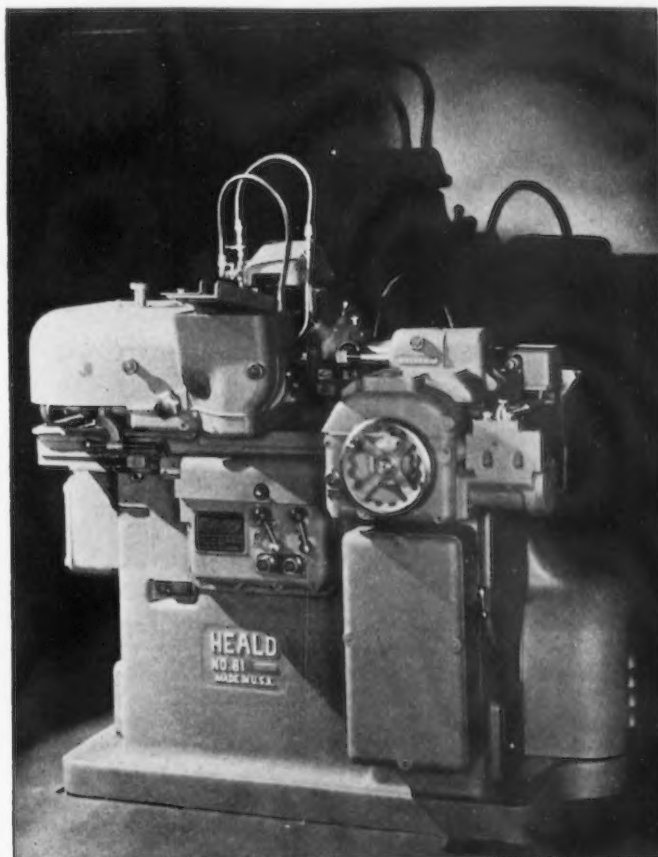
loading and unloading, the centerless machine is similar to the company's new No. 81 chuck-type internal grinder described in *THE IRON AGE* of Jan. 18, page 25. The work-regulating roll unit and work is mounted on a reciprocating table and the wheel-head unit on a stationary bridge that spans the table ways. This arrangement makes for compactness and provides a rigid support for the wheel-head so that vibration at high speeds is at a minimum. Practically all controls and movements, including table reciprocation and cross-slide feed, are hydraulically operated; this not only gives flexibility, but assures the smooth and positive action essential for accuracy and high production.

Work Held Between Three Rolls

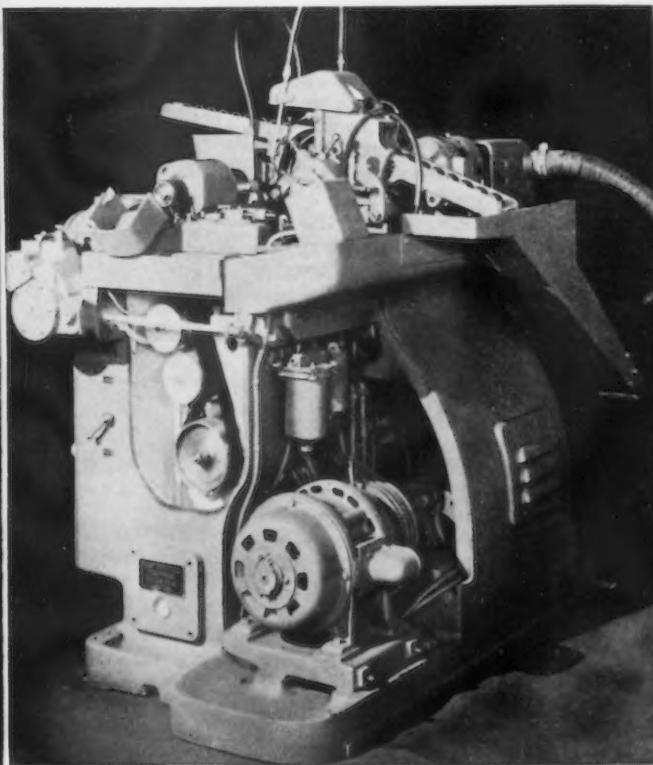
Arrangement of the parts of the centerless work-holding and automatic loading units may be seen in the accompanying close-up illustration. In the external centerless grinding process the work, placed on a work rest or blade, is passed between a rapidly rotating grinding wheel and

a slowly rotating regulating wheel, one of the wheels being tilted to give the necessary feed to the work.

In internal centerless grinders, it is not possible to pass the work through the machine, but a rotating regulating wheel—together with a rotatable work rest or stationary blade, and a pressure roll—is employed. The regulating, or largest, wheel serves to drive and regulate the speed of the work while the grinding wheel is removing material from the bore. It takes the place of the grinding wheel of the external centerless machine, and the pressure roll takes the place of the regulating wheel, thereby providing the usual grinding throat. When grinding pieces having an outside diameter of less than $1\frac{1}{4}$ in., a solid supporting blade is used in place of the supporting roll. The rolls are arranged so that the grinding wheel bears against the inner surface of the work directly in line with the point of contact of the work with the regulating roll. This gives maximum support to the work and assures maximum efficiency of stock removal,



With both the loading and grinding cycles entirely automatic, continuous operation is obtained. Concentricity of bore with the outside diameter is a feature of the centerless holding method. The wheel-spindle drive, which includes automatic take-up idlers, is shown below.



as the wheel action is not affected by "spring" in the piece. Grinding wheel and work rotate in the same direction as in external centerless grinding.

Almost Perfect Concentricity Obtained

When bores are ground on a chucking type of internal grinder the axis of rotation of the work is fixed by the chuck and the workhead spindle, and thus the results in finishing the hole

the work. To hold the workpiece against the backing plate, the pressure and regulating rolls are skewed so as to force the workpiece in the direction of the backing plate.

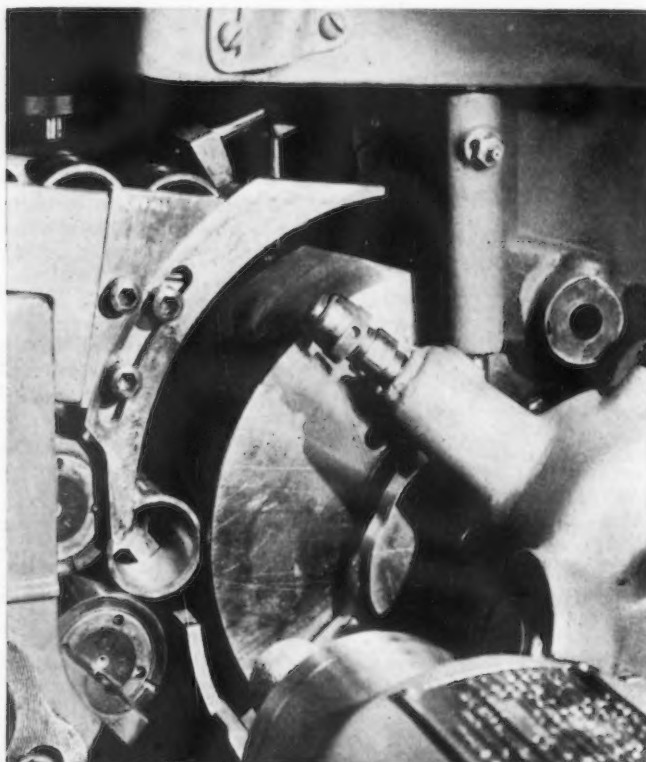
In setting up the Gage-Matic internal centerless, a finish-ground piece is slipped over the gages and the rolls are adjusted to contact with the outside diameter. In setting up the Size-Matic machine a special plug having

The centerless loading cycle starts immediately after the finished workpiece leaves the grinding wheel. It is controlled by a hydraulically-actuated mechanism which is interlocked with the table movements so that the table cannot start toward the wheel until the loading cycle has been completed. This safety feature not only prevents damage to the machine but also possible injury to the operator in case a piece of work should become jammed.

When a piece has been ground, the table runs out to the loading position, where the work is ejected from the machine and a new piece positioned by the loading arm. This arm moves in a clockwise direction and discharges the finished piece over the regulating roll; at the same time a cam on the loading arm shaft actuates a work stop that permits an unground piece to leave the loading chute. On leaving the chute, the unground piece first rests on the back surface of the loading arm, and as the arm moves counter-clockwise, it finally drops on to the regulating roll and is led into position on the workrest roll.

As the loading arm starts in its clockwise movement a cam on the loading-arm shaft causes the pressure roll to move away so that the workpiece can be ejected from the machine and a new one placed in position. The pressure roll then returns to its original position, where it is held by adjustable spring pressure.

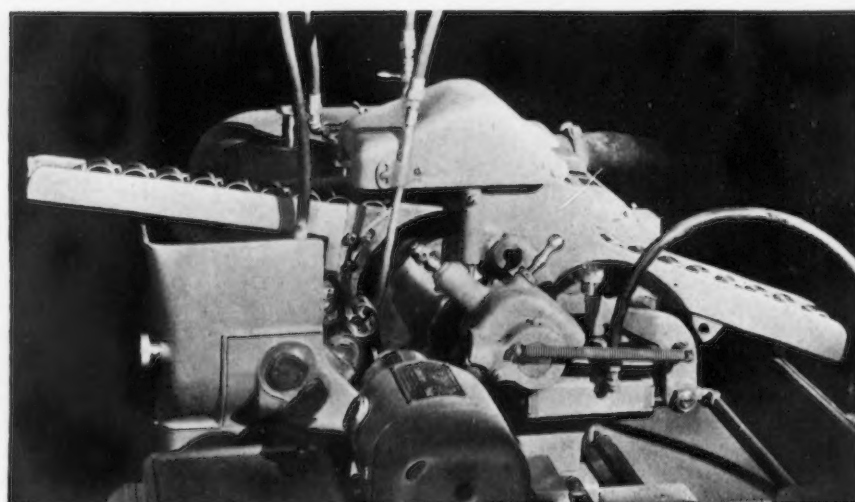
The speed of the regulating wheel is generally fixed; as it drives the work by its outside diameter, different workpieces having the same general



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The pieces to be ground are held between three rolls and rotates on their outer surfaces. Arrangement of these rolls is shown in the view at left. The largest roll, at the right of the workpiece, is the regulating roll. The pressure roll is at the left of the work, and the supporting roll is immediately below it. The loading arm is between the supporting roll and the regulating roll. At the right of the knurled part, at the upper left, may be seen the work stop.

are dependent upon the chucking method. On the internal centerless grinder there is no fixed position for the axis of rotation of the work; in fact, pieces having different outside diameters have their axes in different positions. The arrangement of the work-controlling elements is such that a uniform wall thickness is produced, as it is governed by the distance between the grinding wheel and the regulating roll. This is emphasized as resulting in practically perfect concentricity between the bore and the outside diameter, without elaborate fixtures and close inspection on all operations.

There are two ways of locating the work in the internal centerless. It may be located and squared up from the outside diameter or it may be located from the outside diameter but squared up from the back face. When locating and squaring up from the outside diameter, the lands on the rolls are slightly less than the width of the work being ground, but when it is desired to square up the work from its back face, narrow lands are ground on the rolls. These are sufficient to drive the work, but do not have any great tendency to square up



a portion of its length ground to the same diameter as the outside diameter of the work is used.

Should the working surface of the rolls become rough they must be re-ground. Usually the regulating roll is ground in place, using the wheelhead of the machine. Work rest and pressure rolls as units are ground on their bearings in a plain grinder.

proportion between the bore and outside diameter will run at approximately the same surface speed. Change in the speed of the regulating wheel can be easily accomplished, however, by changing pulleys.

The regulating wheel unit is compact and self-contained, and has an individual ¼-hp. motor for driving the regulating wheel spindle. The

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motor is carried on a sub-base which is pivotally mounted on the table so that taper work can be ground. This work-driving unit is also transversely adjustable in order that different lots of work having various outside diameters can be ground. The spindle is mounted in pre-loaded precision ball bearings having automatic take-up for expansion and wear.

Supporting and pressure rolls are carried by a bracket bolted to the sub-base. The supporting roll is held stationary in an adjusted position, but the pressure roll oscillates to permit loading and unloading of the work.

Wheel-Truing Device Highly Developed

As previously stated, the wheelhead is mounted on a bridge that spans the table ways. The cross-slide with its hydraulic cross-feed, an outstanding feature, is similar to that of the No. 81 chuck-type internal grinder described at length in THE IRON AGE of Jan. 18. Five separate feed adjustments are obtainable, although seven distinct functions are performed by the cross-slide during the grinding cycle. The company's Red Head wheelhead is used on the centerless internals.

The wheel-truing device is a rigid, self-contained unit bolted to a pad on the main table. It trues the wheel just before finish size of the work is reached, and with the true, sharp wheel thus provided for the last few cuts, an excellent finish is obtained. The diamond is lowered hydraulically into the path of the wheel, and is raised positively by a cam on the cross-slide. The diamond-carrying arm is mounted on ball bearings. The device normally works automatically but can be operated manually when desired. The diamond point may be adjusted easily for height or it may be moved in and out without change in height. This is an important feature where small wheels are used, as the change in curvature of such wheels is extremely rapid.

Table dogs are covered by a swinging guard and each dog has a plate giving instructions for adjustments. The various dogs function to control table speed when truing the wheel, cause the table to run out when the Gage-Matic gages enter the work, control the length of the grinding stroke and control the table stroke when truing the wheel.

When the wheel reaches its smallest allowable diameter a limit switch adjacent to the cross-slide functions to stop the machine and prevent damage. This makes it possible for one operator to attend a battery of machines without the necessity of watching wheel wear.

Gravity-Feed Loading Chutes

Standard loading chutes are adjustable to take work up to the capacity of the machine. They are mounted on the pressure and work rest unit,

which is secured to the sub-base that carries the work-driving mechanism. The unloading chute is also capable of handling all work within the capacity of the machine.

The main drive of the machine is obtained from a 5-hp. 1800 r.p.m. motor mounted on the rear of the base, close to the floor, as shown. All drives from the motor are by multiple-V belts or flexible couplings. The oil pump for the hydraulic system and the water pump are coupled directly to the main drive motor. Oil for the hydraulic and lubricating systems is kept clean by being passed through a filter. A sheet metal 30-gal. water

tank is provided at the right-hand end.

Specifications include: Table speeds, unlimited between 0-30 ft. per min.; wheel wear compensation, 0 to 0.0044 in. on diameter of wheel; maximum power cross feed, 0.047 in.; run-in cross feed, 0 to 0.010 in.; roughing cross feed, 0 to 0.047 in.; finishing cross feed, 0 to 0.010 in.; spark out cross feed, 0 to 0.0032 in.; and finishing feed (Size-Matic only), 0.0004 to 0.0032 in. on the diameter of work. Floor space occupied by the machine equipped with coolant tank is 46% in. by 71 1/4 in. The net weight of the No. 81 internal centerless grinding machine is 5000 lb.

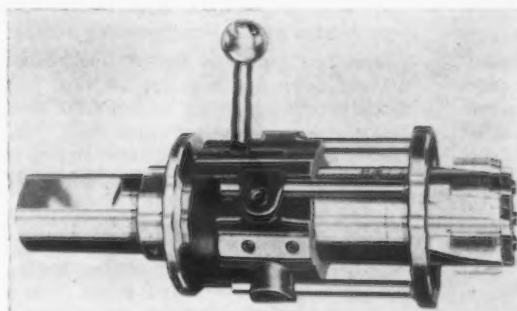
Landis Announces New Line of Collapsible Taps

THE Landis Machine Co., Wayneboro, Pa., is announcing a new line of collapsible taps that supersedes the line of Victor taps manufactured heretofore. Two types are made. One, designated as the Landis style LT, is a collapsible tap for either straight or taper tapping, and the other, the Landis style LM, is a receding chaser collapsible tap for taper tapping. The tools can be used either as stationary or as rotary taps.

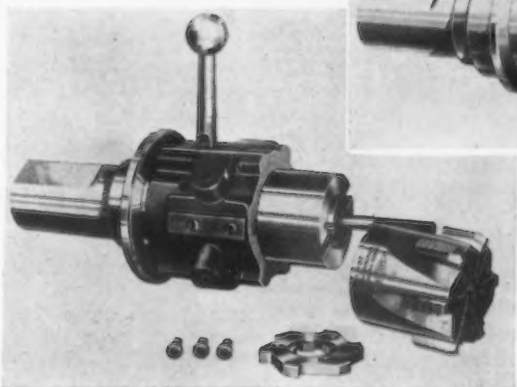
The tap consists of two units, namely, a tap body which contains the operating mechanisms, and a tap head in which the chasers are supported. This design, an outstanding feature of these new taps, permits the use of one tap body to cover a wide diametrical range by the application

of tap heads of various sizes. In addition, the same tap body may be used for either right or left-hand tapping, providing right and left-hand tap heads are employed.

The collapsing mechanism is positive in its action both with respect to locking the chasers in cutting position and in its collapsing action. The collapsing action is obtained through a hardened steel trip ring coming in contact with the part being tapped, thus insuring uniform thread length. The trip ring is adjustable for various thread lengths. Tap heads are adjustable for size through an adjusting screw located in the front end of the plunger. The screw is self-locking and is of the ratchet type, so that a turn of the screw of one notch gives



New Landis collapsible tap, the style LT, for either straight or taper tapping is shown at the left and the receding chaser collapsible tap, the style LM, for taper tapping is below.



At the left is the style LT tool with head detached from the tap body. The design permits use of one tap body to cover a range of sizes of tap heads; in addition, with suitable tap heads the same body may be used either for right or left-hand tapping.

an adjustment of 0.001 in. to the chasers.

Chasers are supported in slots in the tap head and are held securely in tapered seats in a hardened and ground plunger. The plunger is designed to provide maximum rigidity for the chasers, and it is said that there is no tendency for the plunger to rotate under cutting strains and thereby force the chasers out of alignment. All locating surfaces of the chasers are precision ground.

Although designed primarily for straight tapping, the Landis style LT collapsible tap can be used for tapered threads of a length not exceeding the American Tapered Pipe Standards. Five sizes of this tap are made; when equipped with the proper tap heads, these cover a combined range from 1¼ to 13¼ in. inclusive. The Landis style LM tap is also made in five sizes, covering a combined range of 1¼ to 12-in. pipe, or 1½ to 13¾-in. diameter.

used. Simple hand lever action and toggle linkage feed the stock, close the collet, and return the feed finger.

Length of feed is controlled by a collar which may be quickly set. This stop collar gives sufficient accuracy for feeding work that does not require closer overall dimensions than plus or minus 1/64 in. For accurate lengths a stock stop is also used in the hexagon turret.

Balance at high speed is secured by supporting bar stock in the spindle by a removable filler tube, which prevents excessive runout and vibration. Safety is assured by using a full length stationary supporting tube which reaches nearly up to the feed tube. The maximum length of stock that can be exposed is but little more than the 4 in. feeding stroke of the machine. Speed of action has also been improved.

After a bar has been inserted the mechanism requires no further attention until the stock has been used up to its last end. The time required for inserting a fresh bar has also been reduced. The bar support tube can be swung toward the operator to quickly slide in a new bar from the spindle end. A vise, attached to the front end of the tube, grips the stock after it has been inserted into the spindle up to the feed finger. By then actuating the bar feed lever, the feed finger can be forced over the bar stock end quickly and without effort. After releasing the grip of the vise, the bar can then be fed out to the cutting off tool.

The cross-slide of the machine has been redesigned. It is stronger, and the longitudinal stops are now so rigid that 0.001 in. work diameter limits can be readily held when forming. Rigid block-type open-side tool posts are used with screw actuated tool-elevating wedges. Either lever or screw-feed action, or both, can be furnished for this cross-slide.

Without bar feed, the machine occupies floor space of about 2 ft. by 5 ft. 10 in.

High-Speed Turret Lathe Has Built-In Motor Drive and New Bar Feed

A ½ x 4-in. turret lathe with its motor built into the head has been brought out by the Warner & Swasey Co., Cleveland. A new bar feed has also been developed. The new lathe is designed for higher cutting speeds, such as required when carbide or diamond cutting tools are employed, and is particularly adapted for small diameter work and non-ferrous materials where high spindle speeds are necessary.

The machine incorporates a completely self-contained alternating-current motor drive in which the rotor is mounted directly on the spindle and the stator in the head housing. Four speeds, namely, 600, 1200, 1800 and 3600 r.p.m., are available in either direction. Elimination of gearing and belts simplifies the construction, minimizes upkeep cost and reduces frictional losses. As there is but one rotating unit, perfect balance is said to be easily obtained, resulting in smooth, chatterless finish on the work.

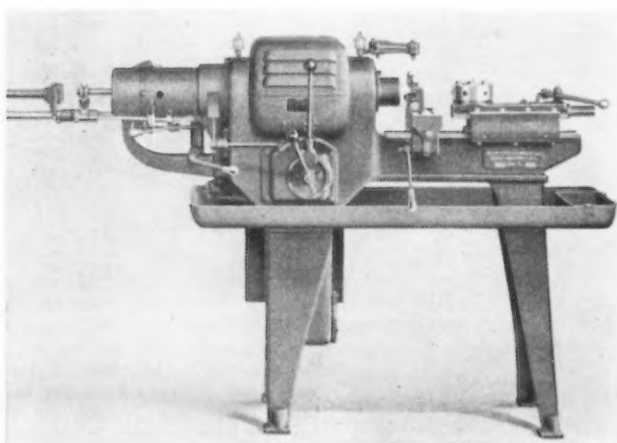
Overheating is guarded against. Anti-friction bearings are used, and are automatically lubricated only when bearing temperatures rise. Fan blades, rigidly attached to the rotor, circulate a high velocity air draft

through cored passages around spindle bearings and motor windings.

Two levers responding instantly to finger tip pressure control the spindle electrically through a drum type controller and automatic relays. The shorter lever selects the four spindle speeds; the longer one stops, starts, and reverses. The spindle can be quickly reversed without damage to the motor, and the number of permissible reversals per minute is ample. A large band brake, actuated by the longer lever in the neutral position, prevents rotation when attaching chucks or loading the work.

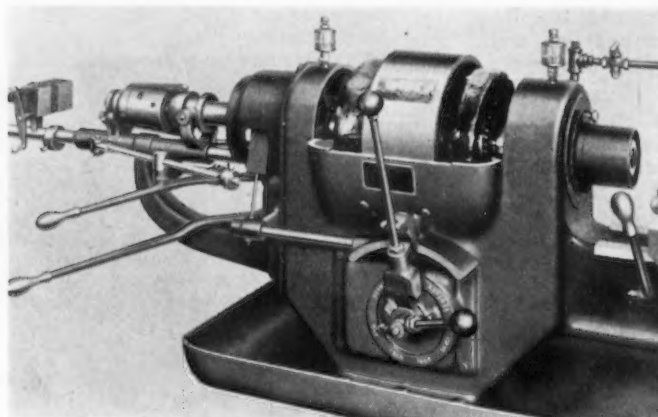
The high speeds of the new lathe have necessitated a new combination of bar feed elements. For this purpose a friction finger bar feed has been developed (also adaptable for other models of high-speed lathes), holding bars in a concentric position in the spindle to prevent vibration, and inclosing them for their full length in a protecting tube for safety.

The friction feed finger lies immediately behind the collet so that bar stock can be used up to the last end. The finger is mounted on a feed tube which, at the rear of the spindle, is reciprocated by a fork. No cams are



New high-speed bar feed, as well as built-in motor drive, features this Warner & Swasey No. 1 "electric" turret lathe.

The driving motor is built into the head, as shown in the close-up view below. Four speeds, from 600 to 3600 r.p.m., in either direction are available. Two levers at the front of the head control the spindle through a drum-type controller and automatic relays.





THE NEWS OF THE WEEK

Freight Tariff Book Compiled by Institute

ONE of the most comprehensive freight tariff books ever issued has been completed, after exhaustive research, by the American Iron and Steel Institute, and is now being distributed throughout the industry.

The book, which is in binder form, with 540 pages, 8½ by 11 in., contains fully 480,000 freight rates from 30 basing points, and covers practically all finished steel products. It was compiled by the Rate Clerks' Committee, a sub-committee of the institute's Traffic Committee. The book is regarded as the tariff "Bible."

Because of the comprehensive character of the book, experts estimate that it cuts down by 40 per cent the time normally required by the average company in checking rates.

According to institute officials, the tariff book provides those who use it with the combined service of the best traffic departments in the iron and steel industry. Each traffic department in every large steel company is assigned a territory to police, and when any rate change occurs this is instantly reported to the institute and the information is transmitted to loose-leaf pages and sent to subscribers of the book, so that it is always up to date.

The book is proving of particular value not only to steel manufacturers, but also to jobbers who have salesmen on the road.

The price of the book is \$20 a copy, and the cost of new sheets is 10c. per sheet.

joint awards go to men who handled the company's exhibits at the Century of Progress exposition, particularly its "House of Magic." Each citation consists of a certificate and a cash award.

The joint award for work done at the Century of Progress goes to W. A. Gluesing, who conducted the demonstration lectures; K. R. Ross, service contact man, and G. E. Simons, publicity contact man. L. V. Bewley, engineer, power transformer department, Pittsfield, Mass., is cited for a new mathematical theory which greatly aids engineers in safeguarding transmission lines from lightning. T. O. Moffit, a foreman in the Newark lamp works, wins an award for devising a manufacturing process which is said practically to eliminate the unsightly white streaks and spots on the globes of automobile lamps. S. R. Bergman, consulting engineer, River works, West Lynn, is honored for devising a new type of bucket for rayon manufacture. Guy S. Purvis, construction engineer, receives an award for emergency work in restoring to service the municipal electric plant of Rensselaer, Ind., following a severe cloudburst and flood last spring. F. M. Clark, physicist, Pittsfield works, is cited for his development of Pyranol, a non-inflammable and non-explosive liquid as a substitute for oil in the insulation of transformers.

Resolution Strikes at Conversion Contracts

COMMERCIAL resolution No. 48, adopted by the board of directors of the American Iron and Steel Institute Feb. 2, is directed against evasions of the iron and steel code effected by finishing semi-finished or raw materials furnished by others. The resolution directs that all conversion agreements made before Feb. 5 and continuing in effect after Feb. 28 be submitted to the board of directors by March 1 for such action as the board deems "consistent with the rights and obligations of the parties to such agreement."

All conversion agreements made after Feb. 5 must be filed with the secretary of the code and submitted to the board of directors for approval. Moreover no conversion agreement may be made by a code member unless the other party to the agreement binds himself in writing not to sell a converted product to a third party at terms more favorable than the most

favorable price, terms and conditions that a code member might produce and sell the product under the provisions of the code.

G. E. Employees Receive Foundation Awards

EXCEPTIONAL achievements by employees of the General Electric Co. were revealed in awards made by the Charles A. Coffin Foundation to 32 men on the company's payroll. These citations are for contributions during 1933 to the progress and prestige of the company and to the advance of the electric art.

The awards are divided among ten engineers, seven factory foremen, five shop workmen, four commercial men, three tool designers and expert machinists, two administrative employees and one construction engineer. Seven of the awards relate to the G-E refrigerator and three to the Thyatron tube. Three others have to do with the incandescent electric lamp. Three

Simplification Approved For Cupola Refractories

SIMPLIFIED Practice Recommendation R154-34, Cupola Refractories, has been accorded the required degree of written approval by the industry, and is to become effective March 15, according to an announcement by the Division of Simplified Practice, Bureau of Standards. This recommendation, which was proposed and developed by the industry, covers the sizes and shapes of cupola lining blocks, tap-out, and slag-hole blocks. It represents a substantial reduction in the variety heretofore listed for regular stock purposes, especially for tap-out and slag-hole blocks.

Reorganization Plan for British Steel Industry Tentatively Approved

LONDON, ENGLAND, Feb. 27 (By Cable).—The British pig iron market is quieter, but output is sold several months ahead and makers are confident of disposing of forthcoming additional output. Cleveland stocks are exhausted and hematite stocks are low.

The steel reorganization scheme has been accepted in principle by the National Federation of Iron and Steel Manufacturers and a committee has been formed to prepare the final draft for submission at a meeting of the federation April 19. The scheme is expected to assist British export trade, as well as the Anglo-Russian trade pact under which a Soviet order for 7000 tons of steel has already been placed here.

New orders for semi-finished steel have slackened, following recent substantial bookings. Domestic demand for railroad and shipbuilding materials is better, but sheet business is depressed. Tin plate is steady, with domestic deliveries maintained and export trade quiet.

The steel reorganization may en-

tail higher minimum prices for tin plate.

Business in Continental iron and steel is hesitant owing to the death of King Albert, but the market is firm and the cartel reports export trade satisfactory, though Hamburg exporters complain of American competition in Central American States; also that there are foreign exchange difficulties in Argentina and Brazil, while business with Manchuria has become impossible following advances in cartel prices.

Fabricated Steel Awards Off in January

JANUARY bookings in fabricated steel, at 71,890 tons, were 14 per cent smaller than those of December and 4 per cent below the total of January, 1933. Shipments, at 45,361 tons, were 19 per cent below those of December and 12 per cent under those of January a year ago. The figures, compiled from returns to the American Institute of Steel Construction by 85 per cent of the industry, nevertheless indicate that bookings in the first month of this year were above the average for last year. Average monthly bookings in the first half of 1933 were 61,603 tons; in the third quarter, they were 64,797, and in the final quarter, 66,306 tons.

Landis Changes Name Of Victor Tap Plant

LANDIS MACHINE CO., Waynesboro, Pa., announces that its Victor plant, also located at Waynesboro, will be known henceforth as the "Landis Machine Co., Tap Division."

The change in name has been brought about by the fact that a new line of collapsible taps, designated as the Landis, now supersedes the older line of Victor taps, and manufacture of the latter has been discontinued.

Galvanized Sheet Cartel Founded in Germany

EFFORTS of leading firms in the German galvanized sheet manufacturing industry for a reorganization of the domestic market have resulted in a price cartel agreement, according to advices from Vice-Consul J. H. Wright, Cologne, made public by the Commerce Department.

The cartel has been adhered to by about 40 companies, and for practi-

cal purposes includes almost all of the galvanized sheet manufacturers of any consequence. Before the founding of the cartel there had been severe competition in the galvanized sheet trade, with consequent inroads on financial returns, the report states.

During September last, a loose agreement was reached, following which slight price increases were effected, but it was not until the founding of the present cartel that prices could be placed on a level which would enable manufacturers again to operate at a profit, the Vice-Consul reported.

New Prices Filed With Institute

NEW lowest base prices filed with the American Iron and Steel Institute effective Feb. 9, follow:

	Base Price Per 100 Lb. Basing Point	F.O.B.
Armco ingot iron galvanized point grip sheets		
24 gage base.....	\$3.99	Gary, Ind.
Galvanized steel point grip sheets.....	3.20	Gary, Ind.
Armco ingot iron alloy coated casket body stock 20 gage base...	4.59	Gary, Ind.
Armco ingot iron alloy coated casket bottom stock 20 gage base...	3.89	Gary, Ind.
Armco ingot iron flume sheets 2 oz. galvanized coating (ave. wt.) 16 gage base.....	3.665	Gary, Ind.
Armco ingot iron long ternes 24 gage base, unassorted.....	3.99	Gary, Ind.
Armco ingot iron cold-rolled strip (oiled)....	3.75	Cleveland
Armco ingot iron cold-rolled sheets 10 gage base.....	2.99	Gary, Ind.
Armco ingot iron sheets cold-rolled 20 gage base.....	2.44	Gary, Ind.
Armco ingot iron hot-rolled annealed tin mill block sheets 28 gage base.....	3.39	Gary, Ind.
	Cents Per Lb.	

Steel plate seconds sheared into rectangular shapes in random sizes and gages. No quality guaranteed and no single piece to contain over 35 sq. ft. Unassorted sizes and gages (effective Feb. 8).	1.25	Birmingham
Same description as above excepting that such plate seconds are assorted to gage (effective Feb. 8).....	1.35	Birmingham
	Per Wheel Treated	

Light-weight freight car wheels 33 in. tread diameter (Feb. 12).....	\$21.50	Pittsburgh
Rim dimensions: 5 1/2 in. x 1 1/4 in.		
Hub diameter: 10 1/2 in.		
Nominal bored weight: 610 lb.		

Hot-rolled carbon sheet steel (effective Feb. 13)	7.50	Pittsburgh
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Carbon 0.75 to 0.95 per cent		
Phos. 0.025 per cent maximum		
Sul. 0.025 per cent maximum		

	Base Price Per 100 Lb.	
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Bessemer or basic mfrs. wire (March 5).....	\$2.65	Pacific Coast Ports
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H. c. spring wire (March 5).....	3.65	Pacific Coast Ports
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	Per Lb.	
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High-speed drill rod, Class 2-A (effective Feb. 22).....	\$1.10	Pittsburgh
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Analysis:		
Tungsten, and/or molybdenum	6.50-9.50%	
Chromium	1.50-3.00%	
Vanadium	0.20-0.80%	

British Prices, f.o.b. United Kingdom Ports

	Per Gross Ton	
Ferromanganese, export.....	\$9	
Billets, open-hrth.....	\$5 10s.	to \$5 12s. 6d.
Tin plate, per base box.....	16s. 4 1/2 d.	to 16s. 9d.
Steel bars, open-hearth.....	\$7 17 1/2 s.	to \$8 7 1/2 s.
Beams, open-hrth.....	\$7 7 1/2 s.	to \$7 17 1/2 s.
Channels, open-hearth.....	\$7 12 1/2 s.	to \$8 2 1/2 s.
Angles, open-hearth.....	\$7 7 1/2 s.	to \$7 17 1/2 s.
Black sheets, No. 24 gage.....	\$9 5s.	
Galvanized sheets, No. 24 gage.....	\$11 5s.	to \$11 15s.

Continental Prices, f.o.b. Continental Ports

	Per Metric Ton, Gold £	
Current dollar equivalent is ascertained by multiplying gold pound price by 124.14 to obtain franc equivalent and then converting at present rate of dollar-franc exchange.		
*Ingots.....	\$2 5s.	
*Billets, Thomas.....	\$2 7s.	
Wire rods, No. 5 B.W.G.....	\$4 10s.	
*Steel bars, merchant.....	\$3 2s. 6d.	
*Sheet bars.....	\$2 8s.	
Plates, 1/4 in. and up.....	\$4 1s. 6d.	
*Plates, 3/16 in. and 5 mm.....	\$4 3s. 6d.	
*Sheets, 1/4 in.....	\$4 8s. 6d.	
*Ship plates.....	\$4 10s.	
*Beams, Thomas.....	\$2 19s.	
*Angles (basic).....	\$3 2s. 6d.	
Hoops and strip steel over 6-in. base.....	\$3 17s. 6d.	
Wire, plain, No. 8.....	\$5 7s. 6d.	
Wire nails.....	\$5 15s.	
Wire, barbed, 4-pt. No. 10 B.W.G.....	\$8 15s.	

*Prices as established by European Raw Steel Cartel.

Compliance Board Makes Decision in Budd Case

NATIONAL Compliance Board of NRA issued a decision Sunday, Feb. 25 in connection with the Edward G. Budd Co. of Philadelphia. In this decision, the board proposes that a ballot be prepared and an unrestricted referendum vote be taken of the Budd employees to determine whether they desire to set up any form of self-organization. The decision states further that, under the supervision of the National Compliance Director, a ballot be submitted, accompanied by a statement outlining the questions involved, "so that the employees may clearly understand the alternatives between which they are asked to make a choice."

The decision recommends that the Budd company, which has already re-employed 800 men, shall take back the remainder who participated in the strike as continued increase in the volume of employment makes this possible.

The decision is signed by William H. Davis, chairman of the National Compliance Board; William J. Barrett, Industrial Member and T. P. Behney, Labor Member.

Should the Budd company not accept these proposals, the Board recommends that the Blue Eagle insignia be removed; that all Government contracts with the company be canceled and that the case be referred to the Attorney General for action.

The Board's decision places considerable blame for the trouble on the employees themselves and adds:

"It is evident that a great deal of antagonism and resentment has been unnecessarily aroused by the fact that the strike was too hastily called, without giving the company and the community reasonable time to consider the merits of the controversy, thereby prematurely creating an industrial disturbance against the best interests of the workers themselves as well as the company and the community."

Budd Comments on Board's Action

In a statement issued after he had studied the board's report Edward G. Budd, president of the company, said he approved the recommendations that striking employees available for re-employment be reemployed as the volume of business makes it possible to do so and that he had already re-employed the greater part of the strikers. He indicated, however, that he considers "Unavailable" those employees guilty of acts of violence in connection with the strike or of conduct in fomenting it.

The board's recommendation that strikers be taken back as continued increase in volume of business makes

it possible to do so, Mr. Budd pointed out, "relieves us of the suggestion that we discharge loyal employees to make places for those who left their jobs." It was a suggestion from the National Labor Board that all strikers be immediately reemployed that was in part responsible for the Budd Company's refusal to accept the National Labor Board's findings.

Commenting on the Compliance Board's recommendation that a referendum vote be taken under the

supervision of William H. Davis, National Compliance Director, to determine whether the employees wish to set up a form of self-government, and, if so, whether they prefer the present employee association or another, Mr. Budd said, this is a matter for the employees and their representatives "to arrange in their own way without interference from us or anyone else."

The representatives of the employees' association, he said, have revised their plan of organization in accordance with procedure discussed with them by Mr. Davis when the latter visited the Budd plant February 10. The revised plan, he said, will be submitted to the employees for a vote.

Weir Addresses Pennsylvania Engineers

ERNEST T. WEIR, Chairman of the National Steel Corp'n, addressing the Engineers' Society of Western Pennsylvania at the annual banquet held in the William Penn Hotel, Feb. 28, declared that there was a definite economic limit at which working hours might be fixed, and that no subject before the country today required such intense study as that of arbitrarily fixing the work week for all industry.

He said in part: "In view of the fact that there are still a great number of people unemployed, a very active movement has already been started for a compulsory thirty-hour week. On the face of it, rather plausible arguments are advanced that this will put more men back to work. I know of nothing that has been proposed that requires more careful investigation and consideration because unquestionably the cost of production will be materially increased through this reduction in hours. There must, therefore, be a limit to the point at which our condition can be improved by the reduction of working hours. It seems to me that this proposal of reducing the working week to thirty hours is one of those ideas advanced in times of economic stress that requires the most careful scrutiny. Unless the thinking men of our nation take a position on such matters in accordance with their convictions, we are apt to be misled by the demand for change at any price."

Touching on unemployment insurance and old-age pensions Mr. Weir continued: "I am heartily in favor of unemployment insurance and old-age pensions, but I earnestly insist that the problem of establishing these measures is one that requires careful study and analysis and that such questions ought not to be product of a popular wave of excitement when people are grasping for something new. These problems can and must

be solved, but the answer when evolved must be based on a respect for established and well proven laws of humanity and economics. There is no twilight zone between justice and expediency. We must address ourselves to these questions on the basis of right, which will insure the adequate protection of all interested parties."

Declaring tyranny and dictatorship to be harmful to civilization, he said:

"The greatest fallacy which has ever been preached or offered to men is that of improvement through radical action. We hear talk of the necessity of dictatorship—all we have to do is to read history and find the answer. No civilization has ever progressed or been beneficial to the great mass of people that has been controlled by a dictator. Such rule is temporary and destructive during its period of control."

He concluded with an appeal "for that courage that will stand up and defend the principles in which we believe and for an insistence on that free and independent expression of opinion which has been one of the great fundamental principles of our democracy from the beginning up to the present time."

Steel Corp'n. Employees Approve Union Changes

REVISIONS in the employee representation plans of the subsidiary companies of the United States Steel Corp'n. were approved last week by overwhelming majorities in balloting by employees at Pittsburgh district plants. The revisions were not of a major character. Changes in the wording of nine sections of the rules were made.

PERSONALS

ROBERT H. CUNNINGHAM has been appointed sales manager of the Union Steel Casting Co., Pittsburgh.

♦ ♦ ♦

JOHN D. WISE, formerly assistant sales manager, Osborn Mfg. Co., Cleveland, has been elected executive secretary of the Foundry Equipment Manufacturers Association, Cleveland. Following service in the war, he became connected with the engineering department of the Osborn company, and had been associated with that organization until recently with the exception of a year he spent with the University of Illinois, Urbana, Ill., as superintendent of the foundry laboratory.

♦ ♦ ♦

FRANK A. NEALON, formerly sales manager of the Sterling Cable Corp., has been made general sales manager of the American Enameled Magnet Wire Co., Port Huron, Mich.

♦ ♦ ♦

CHARLES SCHRAMM has been appointed assistant manager of sales of the New York district office of the American Sheet & Tin Plate Co. WILLIAM A. WEIN has been promoted to a similar position in the Pittsburgh district office of the company.

♦ ♦ ♦

ROGER CLAPP has been named Pacific Coast sales manager of the Wickwire Spencer Steel Co., New York, with headquarters at San Francisco. Mr. Clapp has been with the company since 1922, starting as a salesman and later becoming manager of the eastern division, with headquarters in New York. To improve service in the Pacific Coast district, the company has reestablished its branch office at



R. H. CUNNINGHAM

Los Angeles, with Ben Scott in charge.

♦ ♦ ♦

M. THOMAS KNOTT, formerly identified with the Pittsburgh office of the Motch & Merryweather Machinery Co., Cleveland, has been made manager of the Pittsburgh office of J. W. Mull, Jr., Indianapolis. The Pittsburgh office has been moved to 1302 Clark Building.

♦ ♦ ♦

E. M. ADAMS, first vice-president and general manager of sales, Inland Steel Co., will leave soon on a six weeks' tour through Mexico and Southern California.

♦ ♦ ♦

W. I. BROCKSON has resigned as advertising manager of Steel Sales Corp., Chicago, to become identified with the Commercial Advertising Agency, Chicago.

urer, Wolf Tongue Mining Co., and director of Pittsburgh Cold Rolled Steel Co., all of Pittsburgh.

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CHARLES SPIEGELHALTER, chief engineer, Pusey & Jones Corp., Wilmington, Del., died of pneumonia, Feb. 16, at Atlantic City, N. J. He was 46 years of age, and had been connected with the company for the past 25 years.

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WILLIAM A. SOMERS, chairman of the board, Somers, Fittler & Todd Co., Pittsburgh, died after a brief illness on Feb. 11, aged 81 years. He was president of the company from its inception in 1892 to 1929.

♦ ♦ ♦

ERWIN FOERSTER, one of the founders and vice-president of the Frankfurth Hardware Co., Milwaukee, wholesale hardware and mill supplies, died Feb. 11 from injuries sustained when struck by a motor truck on Feb. 10. He was 83 years of age.

♦ ♦ ♦

FRANK R. DRAVO, chairman of the board of the Dravo Corp., Pittsburgh, and president of the Dravo Contracting Co., was killed in a train wreck at Pittsburgh on Feb. 26. He was born in that city on Aug. 19, 1866, and was graduated from Lehigh University, Bethlehem, Pa., in 1887. In 1891 he organized the Dravo company, and had been actively identified with it during his entire business career.

Enamel Ware Makers To Have Code Hearing

WASHINGTON, Feb. 27.—Hearing on the code for the vitreous enameled ware manufacturing industry will be held March 9 before Deputy Administrator A. R. Glancy. The code has been submitted as a supplement to the approved code for the fabricated metal product manufacturing and metal finishing and metal coating industry, and was presented by the Vitreous Enameled Ware Council.

On the same day Mr. Glancy will preside at hearing on the code for the liquid fuel appliance manufacturing industry, also presented as a supplement to the fabricated products code.

General Hugh S. Johnson, National Recovery Administrator, has announced his approval of the method of election of the following to the code authority for the metal window industry:

C. J. Meyer, Truscon Steel Co., Youngstown, chairman; Guy D. Bayley, William Bayley Co., Springfield, Ohio; Frank Garrett, Hope's Windows, Inc., Jamestown, N. Y.; C. J. McIntosh, Federal Steel Sash Co., Waukesha, Wis.; C. R. Raquet, Detroit Steel Products Co., Detroit; Allston Sargent, Campbell Metal Window Corp., New York.

OBITUARY

EDWARD F. WICKWIRE, formerly vice-president in charge of sales and engineering of the Ohio Brass Co., Mansfield, Ohio, died at his home in Shaker Heights, Cleveland suburb, Feb. 24, aged 58 years. He became connected with the Ohio Brass Co. 28 years ago as a salesman. He retired some time ago because of ill health.

♦ ♦ ♦

JOHN H. SENNETT, superintendent of the welded tube department at the Aliquippa, Pa., works, Jones & Laughlin Steel Corp., died on Feb. 15. He had been identified with the Jones & Laughlin Company since 1915.

SELWYN CLAY EDGAR, JR., former president of the Edgar Zinc Co., which was founded by his father, Selwyn C. Edgar, died recently at his home in St. Louis of heart disease. He was 60 years old.

♦ ♦ ♦

EBEN B. CLARKE, vice-president and director, Firth-Sterling Steel Co., McKeesport, Pa., died at his winter home in St. Petersburg, Fla., on Feb. 22, aged 85 years. He was one of the pioneer steel men of the Pittsburgh district. In addition to his connection with the Firth company, he was treasurer and director, Globe Wire Co.; vice-president and treas-

Sheet Steel Sales Higher in January

SALES, production and shipments of sheet steel products in January reflected gains, according to the report of the National Association of Flat Rolled Steel Manufacturers, Pittsburgh. According to the survey, which is based on figures covering a monthly capacity of 325,000 net tons, or approximately 59 per cent of the country's total capacity of 550,000 net tons, independent makers reported sales of 209,463 net tons in January, compared with 110,263 tons in December; production of 163,622 tons, against 113,111 tons, and shipments of 130,878 tons, compared with 111,867 tons. Unfilled tonnage on Feb. 1 totaled 166,182 tons, or 51.2 per cent of capacity, compared with 92,831 tons or 28.6 per cent of capacity in the preceding month. The January report with comparisons of the two preceding months in net tons, follows:

	Jan.	Dec.	Nov.
Sales	209,463	110,263	88,354
Production	163,622	113,111	102,585
Shipments	130,878	111,867	99,499
Unfilled orders	166,182	92,831	94,270
Unshipped orders	51,388	49,598	50,455
Unsold stocks	54,922	51,622	55,495
Capacity per month	550,000	550,000	550,000
Percentage reporting	59.0	59.0	59.0

Percentages, Based on Capacity			
Sales	64.5	34.0	27.2
Production	50.4	34.9	31.6
Shipments	40.3	34.5	30.7
Unfilled orders	51.2	28.6	29.1
Unshipped orders	15.8	15.3	15.5
Unsold stocks	16.9	15.9	17.1

Old Features of The New Deal

IN the course of an address delivered before the Engineering Society of the University of Pennsylvania, Dr. Dexter S. Kimball, dean of the college of engineering at Cornell University, Ithaca, N. Y., said that experiments such as the Government of the United States is now trying are very ancient. The Code of Hammurabi promulgated about 4400 years ago, he mentioned, "fixes the rates of pay for doctors, veterinarians, and all kinds of artisans, and in many other ways regulates industry exactly as we are trying to do today. History does not tell us what success he had with his code."

"The Statute of Laborers enacted in England in 1349 and which, many times amended, was operative until the industrial revolution, originally fixed the *minimum* working day at 12 hr., and otherwise legislated in favor of the *employer* rather than the worker.

"Modern industrial legislation beginning with the English Factory Act of 1812, has tended to regulate industry in favor of the worker and the public and the NIRA simply extends the principle. In so far as it tends to eliminate abuses such as racketeering unfair competition, and child labor, all thinking men will applaud the act as a progressive step. It remains to be seen how far we can regulate industry and yet retain private initiative and secure the beneficial results of modern productive methods.

"It is at this point that we run up against the economics of the New Deal so called. Setting aside the monetary problem, which I am not competent to discuss, and admitting that higher prices are desirable I know of no economic theory that justifies the destruction of food supplies and the restriction of output in order to supply food and clothing to the multitude. The avowed plan of the President on the one hand to raise prices and the frantic appeal of General Johnson on the other to keep prices down somehow do not seem reasonable, especially when no explanation of the discrepancy is attempted."

Ohio River Steel Shipments Higher

MOVEMENT of iron and steel products on the Ohio River in the Pittsburgh district in January amounted to 54,109 net tons, contrasted with 36,038 tons in December, 39,573 tons in November, and 18,002 tons in January, 1933, according to the latest report of the United States Engineer Office at Pittsburgh. Shipments of steel products on the Monongahela River in January aggregated 27,158 tons, compared with 38,693 tons in December, and 11,734 tons in January, 1933. Shipments of iron and steel on the Allegheny River in January totaled only 590 tons.

Secondary Aluminum Industry Organizes

CHICAGO, Feb. 26.—The Code of Fair Competition for the Secondary Aluminum Industry became effective Feb. 23. In accordance with the provisions of this code, meetings of the membership of the Aluminum Research Institute and of all manufacturers of secondary aluminum were held on Feb. 21 and 22, respectively.

The following were chosen to serve as the personnel of the code authority for the secondary aluminum industry for one year or until their successors are elected and qualified: D. K. Ewing, secretary-treasurer, Aurora Refining Co., Aurora, Ill.; W. A. McKnight, president, William F. Jobbins,

Inc., Aurora, Ill.; J. B. Neiman, manager, Federated Metals Corp., Detroit; W. A. Singer, president, Apex Smelting Co., Chicago; and Walter M. Weil, treasurer, National Smelting Co., Cleveland.

The code authority selected Walter M. Weil to act in the capacity of chairman and W. A. McKnight as vice-chairman. R. D. T. Hollowell, 308 West Washington Street, Chicago, was designated secretary-treasurer of the code authority and his office was made the office of the code authority. James B. Wescott, of Sanders, Childs, Bobb & Wescott, Chicago and Washington, was retained as counsel for the code authority.

Greer Steel to Enlarge Strip Capacity

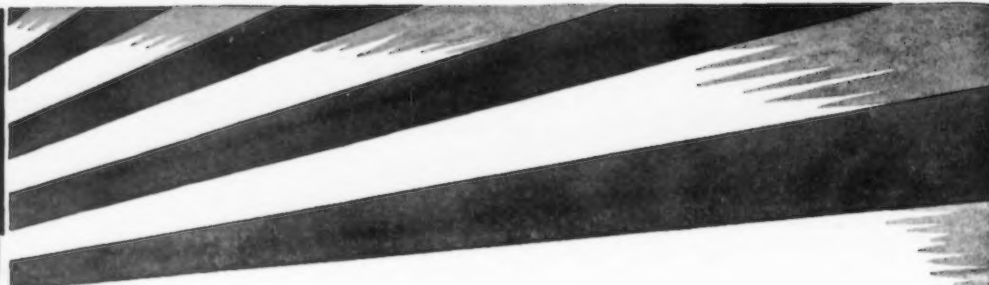
THE Greer Steel Co., Dover, Ohio, has approved plans for a one-story addition, which will add 8000 sq. ft. of space to its plant. The company has purchased a 4-high hot strip mill from the E. W. Bliss Co., Brooklyn, and will increase its capacity for the manufacture of fender and automobile body stock up to 30 in. in width. H. C. Cappel is general manager of the company.

Name Members of Code Authorities

WASHINGTON, Feb. 27.—Official recognition has been extended by the NRA to the executive committee of the Fabricated Metal Products Federation as constituting the code authority for the fabricated metal products manufacturing and metal finishing and metal coating industry. The committee was elected to serve until next October. Its members are: H. S. Kimball and A. H. Ferry, Washington; D. S. Hunter and H. D. North, Cleveland; H. S. Blake, New York; H. R. Naylor, Seymour, Conn.; E. A. Thatcher, Chicago; H. G. Donham, Boston, and W. M. Goss, Waterbury, Conn.

The NRA also has announced the appointment of Michael J. McDonough, labor leader; Jeremiah D. Maguire, New York City banker, and George R. Dempster, Knoxville, Tenn., machinery manufacturer, to be Administration members of the construction industry code authority.

Oscar Grothe, Cleveland, has been named as the Administration member of the code authority for the foundry equipment industry. Mr. Grothe has been connected with the White Sewing Machine Co. for 35 years and has been a member of the American Management Association, serving as vice-president in charge of the production executives division.



▲ ▲ ▲ THIS WEEK IN WASHINGTON ▲ ▲ ▲

Sentiment Against Inflexible Work Week Gathers Momentum

NRA Favors Shortening Hours Under Codes Rather Than by Legislation—Filing of "Time Limit" Prices Opposed

WASHINGTON, Feb. 27.—Indications grow that the work week will be shortened under NRA codes rather than by legislation. While the Connery 30-hr. bill in all probability will be reported favorably by the House Committee on Labor, opposition to the measure has gathered force, despite support by organized labor.

General Johnson opposed the Connery bill in his testimony last week before the House committee. In doing so he was consistent with his position that the 30-hr. week would bankrupt industry. Such prominent figures as Secretary of Labor Frances Perkins and Gerard Swope, agreeing with General Johnson that reduced hours are necessary, also held with him that the best way of handling the problem is through NRA machinery. All opposed the 30-hr. week as being too inflexible. No fixed work week, it was contended, can be established. Cutting the work week to 30 hr. in some industries, it was argued, would make it impossible for them to operate. Hence employment would be reduced, not increased. Likewise, it was maintained, that other lines might be able to operate under the 30-hr. week, but that the resulting increase in prices would cut down the consumer market and again reduce employment.

NRA officials also think that sentiment for readjustment of hours under codes will be strengthened by the "goldfish bowl" meetings now under way in Washington. These meetings are preliminary to the general code

By L. W. MOFFETT
Resident Washington Editor
THE IRON AGE

conferences, which are to begin March 5. The public meetings, at which General Johnson has invited criticism of the NRA, will undoubtedly be an influence in reshaping codes in some important phases and evidently were called partly for that purpose. They will develop material to be laid before the general code conference of all industries and will be used together with NRA data to provide a general combing of codes. Some codes, no doubt, will be changed much more than others. In the heavy industries, for instance, changes in the way of reduced hours are less likely than with respect to codes covering the so-called "white collar" class. General Johnson has said that nothing can be done about the heavy industries, which suffered and are suffering more generally than the consumer goods industries. Nevertheless, there is a strong sentiment toward cutting down hours where they run as high as 40 or more per week. Though there is no uniform work week in mind, but rather a flexible plan that can be adapted to conditions in the different lines, the general mark to "shoot at" appears to be 36 hr.

In his presentation before the House Committee on Labor, General Johnson explained difficulties that were met in getting through codes and specifically cited the codes for the

automobile and bituminous coal industries. He asked that the committee be patient, saying that he felt the problem of hours has been approached as intelligently as any similar problem ever has been. The General warned the committee that it little knew what it would be getting into if it took over the administration of legislation providing for as rigid a plan as the 30-hr. bill.

Miss Perkins and Mr. Swope gave a similar warning. But as to old-age pensions and unemployment insurance in industry the committee and all three witnesses were in agreement. Mr. Swope suggested life insurance as an additional requirement.

"The basic principle of all three is that they should be contributory by employees and employers, which gives the employee the right to participate in the administration of the plans so the funds are not collected and administered for him," said Mr. Swope, "but by him and with him."

He added that the plans should be so comprehensive that when the employee goes from one company to another he will not lose the accumulations to his credit in the pension fund, or be subject to a higher premium on his policy for life insurance because of advancing age.

General Johnson said that not only must something be done promptly to shorten hours but also to raise wages. He is expected to develop this view fully, backed by recommendations, at the general code conference. The question of both shortening hours and raising wages

has been a source of much discussion in industry as well as perplexity for some who do not see how this can be done under existing conditions in many lines, particularly in the heavy industries. General Johnson clarified this point, however, in stating that further shortening of hours should be in proportion to the return of business, "not in one bite, but in two or three bites."

Along with the problem of shorter hours there will be many others coming before the conference, as has been indicated by the published program. One of them obviously relates to prices. Abandonment of the policy of filing "time limit" prices will be insisted upon by the NRA. Meanwhile it has a study under way, and it will be presented at the code conference.

An idea of what the NRA has in mind may be gathered from a new formula it first incorporated in the retail coal code. The price-fixing clauses of that code were knocked out completely, much to the irritation of the trade. In their stead was inserted a formula to prevent sales below "reasonable cost." Supposedly the formula would not be an inflexible one, but would have to be adjusted to conditions applicable to different industries. Nevertheless, the principle itself, if it is adopted, would bring about a sweeping change as to price policies under many important codes.

An outstanding exception is the automobile code. It is represented by many as being the most nearly ideal code yet adopted in the sense that it is held to conform more nearly than other codes to the idea of the Recovery Act. It is simple. It merely carries the provisions covering hours of work, rates of pay and the collective bargaining section—and the merit clause, the only code which has this clause. It has no trade practices. It does not deal with prices even in the most remote way. For this reason it is almost impregnable against attack from critics of price-fixing, monopolies, etc. The merit clause, of course, has provided much ammunition for outbursts from organized labor, but without any damaging effect.

Gray Iron Foundry Code Effective Feb. 26

THE Gray Iron foundry industry code was given Presidential approval Feb. 10, and became effective Feb. 26. Copies of the code may be obtained from the Gray Iron Founders Society, 4300 Euclid Avenue, Cleveland, at 5 cents each. It is planned to furnish each member of the industry with copy of the code as soon as it is printed. Considerable work has been done in making plans to enable the industry to function under the code.

Unionizing Activities Multiply In Steel Industry

WASHINGTON, Feb. 27.—Coming at a time when the public is having its field day in Washington of "constructive criticism" of the NRA, the Amalgamated Association of Iron, Steel and Tin Workers is intensifying its drive to unionize the steel industry.

Even more significant, some industrialists look upon its activities as a forerunner of a new move by its parent body, the American Federation of Labor, to organize the existing open shop industries, with especial concentration upon such major lines as the steel and automobile manufacturing units.

Already the association is trying to force to an early conclusion its controversy with the Weirton Steel Co. Though of the highest importance to industries generally, the association is not resting its case solely on the outcome of this dispute. Widening and making its campaign more impressive, it has laid protests before the National Labor Board with regard to elections in steel plants in the immediate Pittsburgh area. And today it is before the board pressing charges against the Great Lakes Steel Corp., Ecorse, Mich.

Whether or not the association actually is engaged in the role of a "spearhead" for the American Federation of Labor to enforce unionization of open shop industries, those who suspect such strategy concede the moves are well conceived.

They make several points to support their position. At the outset it is stated that the association's moves are timely. They are being made when the NRA is asking for criticism of its policies. William Green, president of the American Federation of Labor, has complained that the NRA has done but little for labor. This despite the enormous gain in the federation membership, its complete unionization of the bituminous coal industry, and other outstanding achievements since the NRA was inaugurated. But organized labor has found difficult going against the steel and automobile industries in particular and apparently feels if it can break in in these lines it will have an open field as to the other important units of industry. The Amalgamated association is the only organized labor unit in the steel industry. With it as a natural vehicle for unionizing the steel industry, it is considered especially well placed at this time, when by far the highest operations in the industry are in its departments—sheets, strip steel and tin plate. Labor trouble in these departments not only would mean much to the steel industry but also to consuming outlets of

these products, such as the automotive and cannery industries.

This fact, it is argued, will not be allowed to escape the notice of the public meetings which are passing upon the NRA, notably those dealing with hours of work, rates of pay, collective bargaining and related labor questions. Since the material to be laid before these meetings is to be presented before the general code conferences of next week, there are those who say the connection is obvious. In short, they maintain organized labor is seeking to show its power in an impressive fashion as an influence on the code conferences in an effort to gain greater recognition. Some go so far as to say the future of the NRA itself largely depends upon what organized labor may accomplish from the public meetings and the ensuing code conferences.

The strategy of the Amalgamated association is further seen in the fact that it has gone to the heart of the steel industry in developing its campaign and may be expected to expand it to other sections.

Meanwhile, organized labor is increasingly active in the automotive units, as shown by its agitation in the Detroit and nearby areas as well as in Philadelphia, where it has a pending controversy with a large automobile body building company, the Budd Mfg. Co. The National Compliance Board has urged settlement of this dispute with threat of taking away the Blue Eagle unless settlement is made.

The drive of the Amalgamated association in the immediate Pittsburgh district steel area was brought to the attention of the National Labor Board last Friday, when a delegation of 14 from the association came to Washington and presented a protest against elections, especially at the Duquesne plant of the Carnegie Steel Co., and at the plant of the McKeesport Tin Plate Co., McKeesport, Pa. Earl J. Forbeck of McKeesport said that, as chairman of the association's District No. 1, he represented 35 lodges, totaling 100,000 employees. The delegation declared that if the steel companies refused to recognize the union they would demand elections supervised by the National Labor Board.

The board stated the delegation showed its notices of the election set for Feb. 23, the day the delegation called upon the board. According to Mr. Forbeck most of the men received this notice only on Feb. 19 or Feb. 20, whereupon the delegation left for Washington to protest. The delegation made the usual charges of interference and intimidation.

The Labor Board statement, issued

last Friday, after reciting the foregoing situation, continued as follows:

The election notices explained that the Employees' Representation Plan, established last June, had been revised "to meet legal requirements as well as to make it more permanent" and had been recommended for approval by the representatives, elected under the plan. An accompanying letter from the company declared that the plan "as amended is entirely acceptable to the management."

A sample ballot as described to the board read as follows:

"Feb. 23, 1934, Carnegie Steel Works, Duquesne, Pa.

"Ballot on acceptance of the Plan of Employee Representation as revised and as recommended by the employee representatives in favor of the plan."

The ballot bore squares for marking yes or no.

The delegation protested that their members objected to voting on the grounds that "either a yes or no was a vote for the company union." They said that the pay day, normally due on Feb. 27, had been moved up to today so that the men received their pay and the ballot at the same time.

The delegation declared that they had evidence of interference and coercion, which they proposed to put into affidavit form. They stated that the elections were taking place in a number of plants simultaneously.

Members of the delegation were given as follows:

Earl J. Forbeck, Joseph Baron, George Leske, William J. Spang, Michael Kovalsky, Louis Movic, Pete Clintner, Ray Zollars, Charles Dougherty, Charles Welch, Fletcher Williamson, Andrew Googler and Frank Lackman.

At the hearing today in the Great Lakes Steel Corp. case, the association alleged discrimination and refusal to bargain collectively. But the Detroit Regional Labor Board, which held hearings on the case last November and December and on Jan. 3 and 12, found charges of discrimination not substantiated in certain cases of workers, according to the National Labor Board statement.

Meanwhile, the National Labor Board last Friday made public its ruling in the case of the National Lock Co., Rockford, Ill., in which it declared that the company interfered with its employees' right to organize and bargain collectively. It ruled that the strike, begun on Aug. 31, 1933, shall be called off and strikers placed on a preferential list and that an election shall be held under the supervision of the National Labor Board. It would include as eligible to vote employees on the payroll when the strike began. It was stated 900 went on strike and that 400 men are still out. The company obtained an injunction against the Chicago Regional Board which had attempted to hold a hearing on Nov. 22. The National Labor Board held hearings Jan. 24 and 25.

In the course of its exhaustive findings, the National Labor Board said

that "the record reveals a studied hostility to the purposes of Section 7-a," the collective bargaining section of the recovery act. It also found that certain questions of fact are still in dispute and would require "further investigation, including the taking of testimony under oath." A point in dispute is whether or not the company received demands served by the men as the walkout began. The ruling says that Section 7-a involves "an obligation on the part of employees

to present grievances and demands to the employer before striking and an obligation on the part of the employer to discuss differences . . . and to exert every reasonable effort to reach an agreement."

The ruling also charged that the company posted a garbled quotation of Section 7-a in the plant, though the company contended it had taken the quotation from a code under which it was operating. The board asserted the quotation was inaccurately copied.

Economic Cycle Illustrated by An "Economonstrator"

WASHINGTON, Feb. 27.—The Washington sections of the Society of Automotive Engineers and of the American Society of Mechanical Engineers saw control of the economic situation transformed into an exact science at a lecture here last week by Dr. H. C. Dickinson, Bureau of Standards engineer and scientist. Doctor Dickinson presented his recently announced theory of "econo-dynamics," designed to bring about a quick return of prosperity and its ensuing control. His address was illustrated by use of a machine he has invented—the "economonstrator."

The economonstrator, consisting of numerous tubes and glass containers, carrying a liquid circulated by two electrical pumps, has been designed to show in a few minutes the functioning of the economic laws under which the world operates. One pump is indicated as "inducement to save," with the interest rate as an incentive, and the other as "inducement to produce." When the pumps are put into operation the machine gives a demonstration of the phases of economic performance of a nation, and the means to maintain prosperity.

The operation of the machine has been described as follows:

Showing the circulation of wealth, the liquid, illustrating money and credit, is pumped from the bottom tank, representing natural resources, into the system. The amount of this wealth first appears in a container indicating the net income or standard of living of the nation, which is mounted on the left of a see-saw beam.

As the standard of living level is raised a surplus of wealth is available. The surplus is pumped into two containers. One is non-productive wealth—personal property—and the other is productive wealth—stocks and bonds.

The container indicating non-productive wealth is directly over the see-saw pivot and the productive wealth container is at the right end of the see-saw. Below the productive wealth container is a second container illustrating the annual fixed interest charges.

The liquid representing wealth is pumped through these containers, which

are connected by glass tubes and valves, in the same manner in which wealth, Doctor Dickinson says, circulates and accumulates in our economic system.

When the nation is prosperous, the see-saw is in a level position, with the standard of living or net income of the nation balancing the total of productive wealth and annual fixed interest charges.

Doctor Dickinson says that unfortunately the prosperous equilibrium is not maintained, because a surplus of savings will cause an inflation of stock and bond values. Arising from the inflation is an increase in fixed indebtedness and consequently an increase in annual interest charges. Depression follows, with interest charges loaded on business and impeding a return of prosperity.

From this, Doctor Dickinson says, is illustrated the principal conclusion of econo-dynamics that depression, collapses or hard times are always indicated when the total payment of fixed interest charges is more than approximately 5 per cent of the total net income of the nation. The first step toward recovery, therefore, is held to be the reestablishment as nearly as possible of the favorable ratio between interest and net income.

The plan urged by Doctor Dickinson, said to have interested officials of the Administration and members of Congress, has been briefly described as follows:

By means of a non-political, non-partisan and completely impartial board, to undertake a program of credit expansion, through which industry would be advanced short-term credit to the extent necessary to increase production 10 per cent of the difference between present business and that of 1929.

The credit would be used by industry for the purchase of materials and the employment of new workers. The entire program would then create, through employment and purchase of materials, a market for increased production, which would provide for retirement of the credit advanced and leave the nation with increased business and no increase in public or private debt.

Merchandising Steel in a New Era

(Continued from Page 28A)

try are able to unload the immense amount of property thrown back on their hands during the past several years. The extent of foreclosures may surprise you if you have not checked the figures. The best estimate I have seen indicates 25 per cent of all single residences, 49 per cent of all apartments and 40 per cent of all office buildings have been foreclosed upon during the past four years. All of this property is now held by the very people from whom new mortgage money must be forthcoming. That is why, I think, we cannot expect an early revival of private building.

The sad plight of the railroads, has been quite adequately publicized, yet even at the depth of the depression they were important consumers of steel. They bought \$117,000,000 worth of steel products even in 1932 and deferred the purchase of \$140,000,000 more. The Government has brought considerable pressure to bear to force railroad buying and is offering large amounts of money on favorable terms. Very sizable purchases of cars, locomotives and other equipment have been made since the first of the year, yet they are but a fraction of the buying that must be done to put our railroads back in first class shape. Some of the figures sound almost fantastic. Using 1925-1929 as an average, it is estimated that a cumulative total of three billions of dollars has piled up in deferred maintenance alone. Experts figure that the rehabilitation of the railroads will require \$700,000,000 for roadway and track, \$200,000,000 for locomotive repairs and maintenance and \$300,000,000 for freight cars. Of the 52,500 locomotives on American railroads, 54 per cent are more than 20 years old and only three per cent are less than five years old. In the light of these figures I think the steel industry is quite safe in expecting substantial business from the railroads in 1934 and also in 1935 and 1936, if they reach a reasonable earning basis.

Since the code has raised the price of oil there has been a mild revival in the purchase of tubing, casing and other steel products, yet the spectre of overproduction still overhangs the oil industry. Here is one case where time will correct the evil whether population increases or not. In 1900 coal furnished 91 per cent of our mechanical energy—petroleum four per cent. In 1930 coal furnished only 60 per cent—petroleum 31 per cent. It is estimated that by 1950 petroleum will be furnishing more than 45 per cent of America's mechanical energy, requiring one and a half billion barrels of oil annually. The temporary overproduction problems of today will vanish in the face of such mounting

demand. And this spells real tonnage for those in the business of producing oil country goods. Fifty-five tons of pipe and tubing alone are used in each one of the 11,000 shallow wells in the East Texas field. In California, where they go down 8000 feet and more, a single well may use 500 tons of pipe and cost \$250,000.

Merchandising Must Start With Raw Materials

I mentioned a while ago that merchandising was entering the steel industry. I don't mean selling alone—I don't mean advertising specifically. I mean starting the product from the raw material with the customer in mind—making what he needs and wants, not trying to force him to use what we find it most convenient to produce. That's what I mean by tailor-made steels. There was a time, as you all know, when steel was a commodity with pretty well defined characteristics, and all design was obliged to conform to its limitations. Today we're building aviation engines that weigh less than two pounds per horsepower.

The great steel industry was built and its organization developed for the purpose of producing steel to meet a demand that grew by leaps and bounds for two generations. This production organization is still there. Now we must not only make steel, we must sell it.

The old type of selling has practically become a thing of the past, even among those raised in the old tradition. Today, no one buys anything on impulse, sales resistance is high, competition is keener and selling has become much harder work. Most of the "high-powered" boys have fallen by the wayside as a result, and in their places we have the thoroughly trained salesmen of today. Which brings me at long length to the purchasing agent's relation to the sale of steel. Many of our salesmen feel that they are not given sufficient opportunity to render the service they are equipped to provide. By this I mean advice on grades and finishes, and, in the case of alloy steels, on analyses and methods of heat treatment. Many steel salesmen today are equipped with both technical and practical training. They are able, if given the opportunity, to study, analyze and prescribe for the buyer's needs. In the old days when steel was a commodity with generally standardized properties, such service was not so necessary. Today, with the development of new alloys, new properties and new finishes in such numbers as to be confusing to almost anyone, the buyer has everything to gain and nothing to lose by taking the sales-

man of any good steel company into his confidence.

It is probably needless to suggest that buyers keep abreast of the developments occurring so rapidly in steel and in the broadening uses of steel; yet, I saw a graphic exhibit just outside of Cleveland not long ago which showed that somebody didn't. Along a railroad siding was a huge pile of wood with the sign, "Firewood for Sale." Inspection proved it to be carload after carload of finished parts for automobile bodies, all carefully cut and grooved and rabbetted together—all ready for final assembly. A lot of somebody's money was in that pile.

Growth of Stainless Steel

The one development in steel which to my mind outshines all others of the past decade is the amazing growth of the stainless steels. They have literally been used for almost everything from fine jewelry to tank cars. And when you consider that the first really important tonnage of the material came when Ford used it for radiator and lamps on his first Model A, you will appreciate how recent has been this broad development. Stainless has gone right through the depression showing consistent gains, entering new industries, replacing old materials. It has even put non-ferrous alloys for aircraft on the defensive. We had a lot more stainless steel on the Macon than we did on the ill-fated Akron, and some very interesting experiments are being carried on pointing to its wider use in structural members. The United States Navy bids fair to be one of the most important single customers for stainless. It is being used for everything from pots and pans to gasoline storage tanks.

Nearly every industry processing food products of any description is now using stainless and some, such as the dairy industry, have adopted it almost exclusively. It is being used for false teeth and for the new high speed trains, for etched portraits and for tubes in oil-cracking stills. And here, I might mention, is a use for certain grades of stainless which has nothing to do with its appearance. I refer to high temperature service, of which oil refining is an example. The new cracking processes by which such extremely high gasoline yields are obtained from crude oil were made possible by the availability of the stainless steels in tubular form. Stainless tubes are now operating at constant temperatures of 1800 deg. and under extremely high pressures with perfect safety. Never before the advent of stainless had metal been available in any form except castings which could maintain its strength at such temperatures. Some of the technical people feel that the use of stainless in high temperature service will be its biggest field, as they expect it

ultimately to revolutionize accepted methods of steam generation.

It occurs to me that it might not be a bad idea to take those of you who buy steel or fabricate steel products behind the scenes and let you see some of the early history of these tailor-made steels I've been talking about. To set the stage I'll have to tell you a little story from real life.

About 1905 a young mechanic named Ford had chicken for Thanksgiving because turkey was too expensive. Today Ford cars cost less per pound than turkey. In those days he was building and racing his own cars, testing his ideas on the only proving ground then known to the industry. In a Florida road race in which he was a contestant a French car was badly wrecked. Ford noted while examining the wreckage that valves and many other parts of this car were smaller and lighter than anyone who had any regard for his own neck had ever dared to use in this country. He took some of the pieces to a laboratory, had them analyzed and found them to be chrome vanadium steel. It probably was at that time he conceived the vision of the light, safe, very low-priced car which was to revolutionize the American standard of living. Such steel had been made, but only in very small quantities at very high cost. Ford began a weary round of the leading steel makers to induce them to make such steel in commercial quantities in an open hearth furnace at a commercial price. He met with nothing but refusal. The idea was considered entirely impractical. Finally he came to a little steel company in Canton, Ohio, which probably needed business badly enough to try anything. After many failures the method was worked out and the commercial alloy steel industry was born.

The first Model T came out, full of alloy steel and weighing exactly 1250 lb. What happened thereafter is history and the little steel company for many years enjoyed practically every pound of the Ford business and grew and prospered accordingly. During the rapid development of the automotive industry it was quickly discovered that steels tough and strong enough for certain applications could not be hardened sufficiently for gears, let us say. Hundreds of similar problems presented themselves as automotive designers outdid each other in developing faster, safer, stronger cars. There was no experience to go by and as a result tremendous research facilities were built up, on a scale that old line tonnage steel companies had never dreamed of. The era of special steels began. This indicates the type of facilities which any steel company must build up in this era of special steels, and to indicate that the buyer of steel today receives and has a right to expect something more than the smelted product of so much iron ore, coke, limestone and scrap from his

source of supply. He has a right to insist on expert metallurgical knowledge and advice as part of his steel purchases, and he gets them today from any good steel company.

That is why I urge the steel buyer to take the mill representative into his confidence. One of two things may happen—a better quality product for a given purpose at no increase in cost, or maintenance of the same quality at lower cost. Give the salesman information fully and freely. Our operating department frequently refuses to fill perfectly legitimate orders because they do not know enough about the ultimate use to which the steel will be put. It's hard to imagine anyone refusing business these days, but it actually happens. Under the New Deal and an open price policy the steel buyer must make his decisions on quality and service. Service to be efficient must be a cooperative proposition between buyer and seller.

I am not pessimistic about the business outlook or out of sympathy with

the effort being made at Washington to solve our current troubles. World conditions are definitely better, which after all is the basic requirement for recovery. There are a million fewer people on the dole in England. In nearly every commercial country improvement is unmistakable. And we have no particular worries about Governmental excesses over the long pull. Government will tend to become more and more conservative as this country ends its pioneer era and enters its "Old World" phase. If I have any message for the man who buys steel it is this—consider the old order a thing of the past; take advantage of the new things steel has to offer you; give us a chance to demonstrate what we can do for you under our own New Deal, because we're having one. The leopard has changed his spots and, speaking generally we're trying very hard, as an industry, to live down the reputation gained in the old days of the industrial giants whose slogan was, "We make steel; come and get it."

Milwaukee Road and Other Lines Get PWA Loans for Rails and Equipment

WASHINGTON, Feb. 27.—The Interstate Commerce Commission has approved a PWA loan of \$8,187,383 to the Chicago, Milwaukee, St. Paul & Pacific railroad for the purchase of equipment and rails and to finance repair work. Equipment to be bought includes 25 all-steel baggage-express cars; 50 all-steel passenger coaches; 30 high-speed freight locomotives, 22 dining and lounge cars and 300 Evans auto loaders. The carrier will buy 20,000 tons of rails, together with the necessary track material, and will strengthen bridges and lengthen turntables and engine stalls.

The Lehigh Valley has applied to the Interstate Commerce Commission for approval of a PWA loan of \$600,000 for the purchase of five locomotives with tenders. The PWA allotment has been made.

Allotment of \$1,000,000 to the Gulf, Mobile & Northern was announced last Friday by the PWA. It also allotted \$331,000 to the Pittsburgh & West Virginia at the same time.

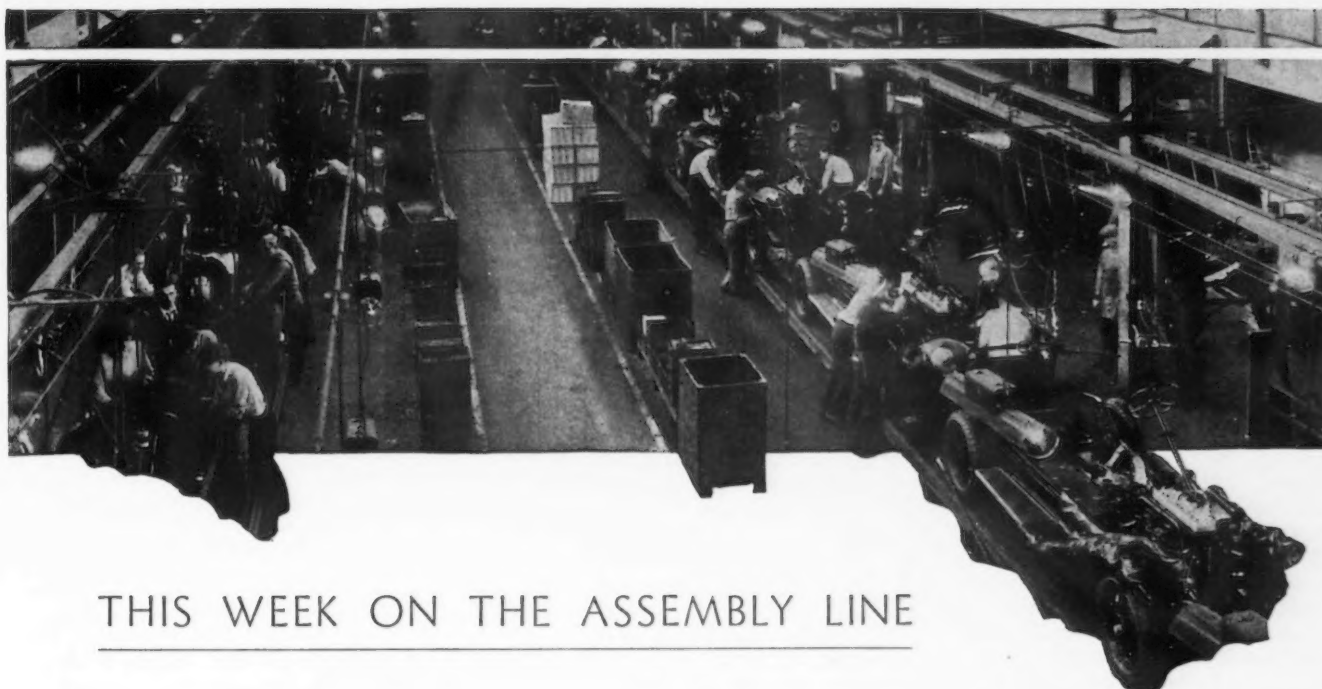
The Gulf, Mobile & Northern will purchase 200 freight cars, estimated to cost \$500,000, and passenger equipment which will cost the same amount. The freight cars probably will be constructed in Alabama. The passenger equipment, which has not been ordered yet, may be of the new high-speed, streamline type now being put into service by the Union Pacific and other roads, depending on operating results in the next few weeks by trains now being tested.

The P. & W. Va. will purchase three heavy freight locomotives which will be built in the Baldwin plant at Eddystone, Pa. In order to expedite manufacture and delivery of these engines the railroad has negotiated provisional contracts for them, subject to confirmation after consummation of the loan contract with PWA and obtaining the requisite approval of the Interstate Commerce Commission. The first engine is to be delivered in 22 weeks after funds are assured and the other two engines in the following two weeks.

An allotment of \$1,462,000 to the Public Works branch, Treasury Department, for the construction or remodeling of 14 public buildings has been announced by PWA. The largest outlay will be \$444,000 for a new court house and custom house at Mobile, Ala. Extension and remodeling of the present Federal building at Joplin, Mo., will cost \$150,000, while \$129,000 was allotted for extension and remodeling of the present Federal building at Ithaca, N. Y.

Because of the exhausted status of the public works fund, the PWA has adopted a policy of hereafter considering for allotment only projects of public bodies and railroads subject to the Interstate Commerce act. It will not consider applications from limited dividend housing corporations or of private schools or private eleemosynary institutions. It was stated that the new policy is not to be construed to mean that no further money is to be allotted for low-cost housing and slum clearance.

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Output Rises to 300,000-a-Month Pace; Ford to Make Strip Steel

DETROIT, FEB. 27.

FOR the first time in almost three years motor car production the past week rose to a 300,000-a-month pace. Assemblies in March seem almost certain to be at least 350,000 units. With the exception of April, 1931, when 354,098 cars were made, this promises to be the highest figure since June, 1930.

General Motors alone has about 140,000 units scheduled the coming month, of which 100,000 is for Chevrolet and 20,000 for Pontiac. Chrysler hopes that all of its divisions, by pushing ahead at the greatest possible speed, can turn out 100,000 units. Ford would like to get up to a similar level. Thus the Big Three have plans for producing 340,000 units during March.

Whether these major manufacturers will be able to reach their goals is dependent largely on their ability to secure materials and parts, particularly bodies. In fact, the failure to get an adequate supply of bodies is now holding back one leading company from increasing its operations to the desired height.

Labor Situation Delicate

Labor developments also may prove to be a limiting factor on automobile production. Four plants at Toledo making automotive parts are tied up by a strike of their employees. It is hoped that labor disturbances will not spread into southern Michigan, but the restlessness among workers of many factories, stimulated to action

by union organizers, may manifest itself in a strike here at any time.

Realizing that their chief production problem today is to get a steady flow of parts into their plants in large volume, the more important companies are calling on outside suppliers for help in increasing numbers. Chevrolet is reputed to have awarded contracts to independent shops for small stampings to supplement those fabricated at the local gear and axle plant and for screw machine parts turned out at its Bay City, Mich., division.

Chrysler, as previously reported, is counting on outside concerns for parts which have been produced mainly in its own departments. Anticipating an expansion of output beyond the capacity for which the Rouge plant is tooled up, the Ford Motor Co. is reported to have asked for prices from independent firms on various parts, including small forgings, which are now made at Dearborn.

In some cases automobile companies are being quoted higher prices on parts because of recent upward adjustments of wage scales by parts manufacturers. The increased labor rates have been awarded in the last few weeks to workers who have threatened to strike unless they were given higher wages.

All G. M. Divisions "Spanking" Big Steel Mills

The troubles of the steel industry growing out of certain provisions in the steel code repugnant to Detroit consumers seem to be increasing rath-

er than diminishing. The policy adopted by the Chevrolet Motor Co. of attempting to "spank" large steel companies by spreading its tonnage over a number of small mills, as reported exclusively in THE IRON AGE of Feb. 1 and Feb. 8, has extended to other General Motors divisions. This is a protest primarily directed against the "one-price" feature of the code as well as against threatened higher prices for second quarter. This policy of retaliation has been applied particularly to orders for forging steel and alloy steels.

Ford To Expand Steel Finishing Capacity

Now comes the admission by the Ford Motor Co. that it has placed an order with the United Engineering & Foundry Co. for a large blooming mill, a continuous strip sheet mill rated at 54 in. capable of rolling sheets 48 in. side and three stands of four-high cold-rolling mills. The hot mill consists of five stands of 4-in. stands of four-high mills. The total expenditure for this expansion of the Ford steel plant is put at \$10,000,000. With two blast furnaces and 10 open-hearth furnaces Ford now can manufacture about 600,000 tons of ingots annually. If 20 per cent is allowed for loss in the breaking down and finishing processes, the amount of finished steel which Ford can make unless it buys billets and sheet bars outside is about 480,000 tons. Although the specifications of the new sheet mill are not known, it is understood in the local steel trade that Ford could design the mill so as to roll all of the sizes of sheets which it now uses. It is almost certain that the mill will be employed to produce frame stock going into the fabrication of Ford frames at the Rouge plant. It is estimated that about a ton of steel goes

into every Ford car. In 1933 Ford output is figured at 519,500 units. If Ford assemblies continued only at this pace, practically all of Ford's steel requirements could be taken care of at the Rouge plant as soon as the new units are installed. However, it is not unreasonable to expect that as the country recovers from the depression and the retail market for cars grows Ford production again will be 1,000,000 a year. This would mean that Ford still would have to buy over half of its steel from outside mills.

It is not known whether the present Ford blooming mill which rolls down ingots about half the size of commercial steel plants will be scrapped or perhaps retained to roll alloy steel ingots. Ford lately has been making practically all of its alloy steel bar needs on its own mills.

Ford's decision to build a sheet mill is believed to have been influenced greatly by events which have taken place in the steel industry since the steel code became effective, particularly the one-price provision and the rise in steel prices. It likewise has been deprived of taking full economic advantage of water deliveries of steel for which the Rouge plant is ideally located. Whether Ford can make its own steel cheaper than it can buy it outside is a moot question. It is significant, however, that its steel plant was closed down for more than a year during a period when steel prices were at rock bottom and Ford output also was at a low point. The steel mill expansion at Dearborn is believed to have absolutely no relationship to introduction of a small car this year, as hinted at in other publications. There have been no developments at Rouge giving any grounds for belief that plans for manufacture of the small car have been or soon will be revived. It is estimated that the new Ford mills will not be ready to operate for six months.

Strip Price Controversy Centered on General Motors and Ford

Ford and General Motors both were in the spotlight the past week in an affair which threatened to develop into the first serious price squabble in the steel industry since the code took effect. A Chicago steel maker recently dropped the price of hot-rolled strip \$1 a ton. This cut the differential between the Chicago and Pittsburgh base prices to \$1 and gave to A.O. Smith Corp., an advantage never before enjoyed in buying stock going into the manufacture of frames for General Motors cars. It was assumed that, sooner or later, this concession would be passed along to General Motors in lower frame prices.

This situation stirred the Ford company to make vigorous protests, so the story goes, about the price it was paying a local steel mill for hot-rolled strip stock fabricated into Ford frames at the Rouge plant. The result was that the local steel maker

filed a price schedule with the American Iron and Steel Institute lowering its quotations \$1 a ton for the remainder of the first quarter, thereby restoring the \$2 a ton differential between Chicago and Pittsburgh. It was not long, however, until both the Detroit and Chicago mills withdrew their new schedules and hot-rolled strip again is quoted at 1.75c., Pittsburgh, and 1.85c., Chicago. It is believed that these prices will not be changed for the second quarter.

The sheet price structure is not likely to be disturbed the coming quarter. Neither is the price on forging stock. That recent protests of automobile companies have been a factor in the decision of steel mills to go along at or near present price levels cannot be denied.

Chevrolet Passes 4000-a-Day Mark

Chevrolet went across the 4000-a-day mark the past week. Its assemblies this month will be above 70,000 units and in March at least 100,000. Buick to date has manufactured 18,438 units since the first of the year and has 10,000 scheduled for the coming month. Oldsmobile assembled its first six-cylinder car the past week; it is making about 250 eight-cylinder cars a day.

Chrysler's success in producing 100,000 units in its various divisions during March and 102,000 in April, as the tentative schedule calls for, will not be an assembly problem. Plymouth, which has two assembly lines at its local plant, has added a second shift to speed up output. Heretofore only one shift of assembly line workers is said to have been employed, although machining and parts departments often operated two and three shifts. Plymouth got up to about 1800 cars a day in the last week.

Plymouth Shipments Heavy

Plymouth's shipments in the week ended Feb. 24 totaled 7558 units. In the first 24 days of February they amounted to 23,907 units. Orders received by the Plymouth factory for February and March deliveries total 82,566 units.

Dodge is going at a good rate. Chrysler's Jefferson Avenue plant is said to be assembling about 300 Chrysler sixes and 200 De Soto and Chrysler Airflow cars a day. For the seven-day period ended Feb. 17 Hudson-Terraplane shipped 2412 units, the best week since July, 1932, when the Terraplane car was first being introduced. The third production line at the Hudson plant will be in full operation shortly. About 18,000 units are scheduled for March.

Graham-Paige turned out 2263 units in February and will make 3000 units the coming month. Since Jan. 1 it has received orders for 3800 units. Packard, Auburn and Hupmobile are among the smaller companies which increased their output the past week.

Retail automobile sales are well distributed throughout all sections of the United States. Because of its dense population, which naturally results in heavier sales there than elsewhere, the Atlantic seaboard district, including New York and the New England States, is absorbing about one car out of every five. However, one of the most encouraging developments is the expansion of demand in the Middle Western agricultural areas, where business has been stimulated by Government bonuses. Formerly the South, from Georgia to Texas, and the Mississippi Valley were the two poorest retail trading districts in the automobile industry. Now they are proportionately among the best.

Dodge Drops Equipment Deal

Equipment buying lagged the past week. Dodge Brothers is understood to have contemplated large purchases of machine tools to augment production, but when it was discovered that deliveries of tools probably would stretch out over six to eight weeks it was decided to postpone or drop the program. That is, the Dodge management is particularly eager to have considerably larger capacity in March and April, and if machine tools could have been delivered immediately they would have been bought. But Dodge is not sure that it will want this equipment May 1, so negotiations were halted.

Peter Savo, associated with Whitlock Smith & Co., Penobscot Building, Detroit, is visiting equipment makers in this country not only with regard to prospective purchases of tools and parts by Yugoslavian motor car and airplane companies, but also in connection with a prospective buying program by Chinese airplane manufacturing interests.

Andre Citroen, French car maker, is a step ahead of American companies. It is reported that he shortly will bring out a car with front-wheel drive, independently sprung wheels, hydraulic gear shift and no chassis frame.

Steel Users Forced To Shop Around

Steel orders continued heavy the past week, particularly from Chrysler and Ford. Strip and sheet mills are so tightly booked for the remainder of this quarter that users are finding it necessary to shop around to place tonnage, and even then sometimes must split up 1000 tons or less among two or more mills. Releases of forging steel have increased. Newton Steel Co. started its Newton Falls, Ohio, sheet mill on Feb. 19 and has it as well as its Monroe, Mich., plant booked to capacity through the current quarter.

Kelsey-Hayes Wheel Corp., as well as A. O. Smith Corp., is understood to be making steel housings for Chevrolet's coil springs.

(Continued on Page 68)

SUMMARY OF THIS WEEK'S BUSINESS

Upward Surge of Activity Is Reflected in Further Rise of Output and Scrap Prices

Production Now 47 Per Cent of Capacity—Scrap at Highest Level Since 1930—Confusion in Price Situation Being Dissipated

THE upward surge of activity in the iron and steel industry has gathered added momentum. Ingot output has made further gains, scrap prices have reached new high ground, and consumer demand has become more and more diversified. The only reactionary influences are severe weather conditions, which have held back building operations, and sporadic labor difficulties, especially among automotive plants in the Chicago district.

Raw steel production has risen from 44½ to 47 per cent of capacity, the highest rate since last August. Operations are up one point to 28 per cent at Pittsburgh, two points to 29 per cent in the Philadelphia district, five points to 55 per cent in the Valleys, two points to 67 per cent at Cleveland and six points to 49 per cent at Buffalo. Chicago remains unchanged at 44½ per cent, Detroit at 77 per cent, the Wheeling district at 80 per cent and the South at 50 per cent.

Scrap prices are stronger in virtually all centers, and advances in heavy melting steel at Chicago and Pittsburgh have raised THE IRON AGE scrap composite from \$12.25 to \$12.75 a gross ton, its highest level since October, 1930.

DEMAND from the motor car industry shows no abatement and is reflected in the heavy bookings of sheet and strip producers. Several mills are now turning down orders for cold-finished sheets and enameling stock, as their capacities for these grades are fully taken up for March. Retail orders for automobiles now exceed 60 days' capacity production and are in the largest volume since 1929. The one threatening factor is continued labor agitation, which has succeeded in building up dissatisfaction among automobile workers notwithstanding that their total earnings this year will approximate those of 1929 if the current rate of activity is maintained.

STEEL bookings from the automobile sector are being supplemented by broadening demands from other sources. Mills are commencing to get releases from the Pennsylvania Railroad against its purchase of 72,000 tons for car construction, as well as its orders for electrification work. Specifications for the 175,000 tons of steel for the Van Sweringen cars are being prepared and should reach the mills late this week or early next week. Early action is looked for on 105,000 tons of rails wanted by the Baltimore & Ohio, the Erie and the New York Central. The time limit for closing rail contracts at the present price of

\$36.37½ will be postponed from March 1 to March 31, with final delivery extended from June 30 to July 31. A resolution authorizing this change has been submitted to the board of directors of the American Iron and Steel Institute for approval at its next meeting, March 15.

HEAVER demand for steel is coming from a wide variety of smaller consuming groups, including makers of road machinery, farm equipment, electric refrigerators, radios and stoves. Tin plate business is supporting an output of 60 per cent of mill capacity. Export trade continues to expand.

Fabricated steel lettings remain light, totaling 6700 tons compared with 14,925 tons in the previous week. It now seems probable that it will be May or June before the steel industry will benefit in a large way from Government-financed building projects.

STEEL prices, despite the code, continue to respond to the pressure of the automobile industry. The dissatisfaction of motor car builders with the single-price policy now observed by the mills was first reflected in the reported moves of General Motors to acquire steel capacity and has now culminated in the award of a contract by Ford for the construction of sheet and strip capacity. While the Ford mills will not be completed for six months, it is estimated that they will take care of half of the company's flat-rolled steel needs, if its output totals 1,000,000 cars a year.

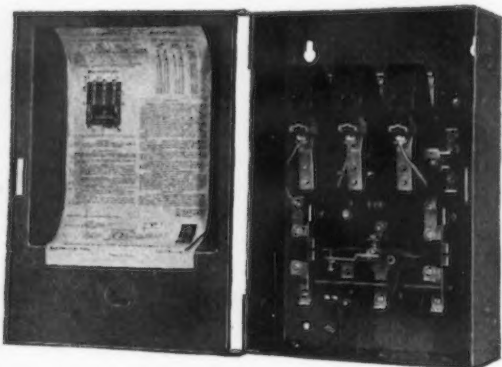
Unquestionably these developments have tended to break the morale of the steel trade. A recent cut of \$1 a ton on hot strip at Chicago is directly traceable to pressure from the automotive industry and the same can be said of a later reduction of \$1 a ton on the same product at Pittsburgh, as well as a \$2 a ton mark-down on so-called Ford steel, a hot-rolled pickled and deoxidized sheet used by Ford in place of cold-finished material. While producers are now expected to withdraw these reductions, not all mills have yet done so. This retreat in the face of the automobile industry's guns may prove to have been merely temporary, but it has apparently forestalled any general advances in sheet and strip prices which might affect second quarter tonnage. If higher prices are now filed, consumers will probably be given 10 days to cover for the quarter and thus only spot orders will be affected by the advances.

THE IRON AGE composites for finished steel and pig iron are unchanged at 2.028c. a lb. and \$16.90 a ton respectively.

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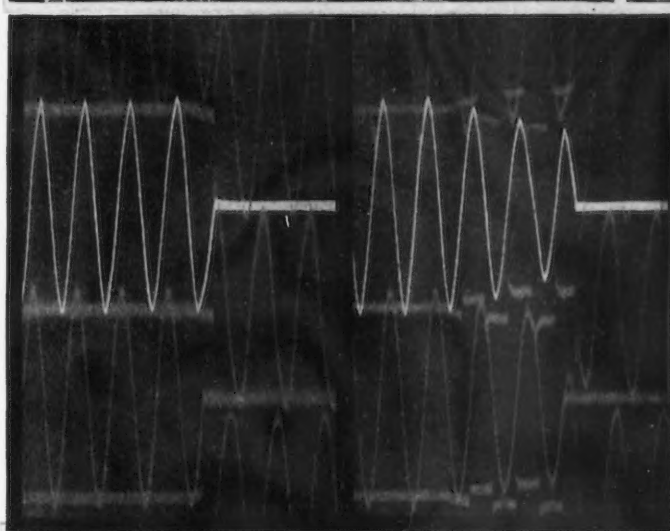
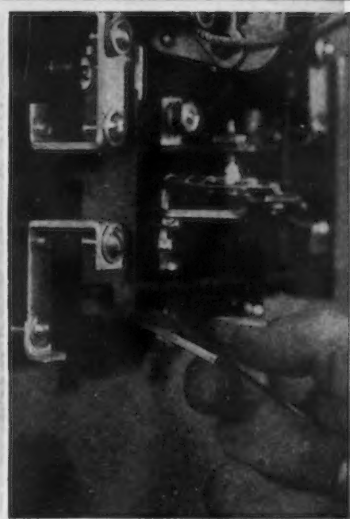
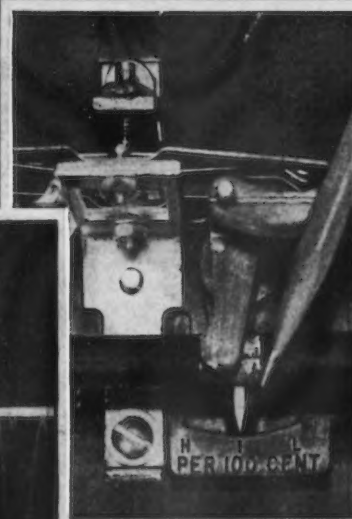
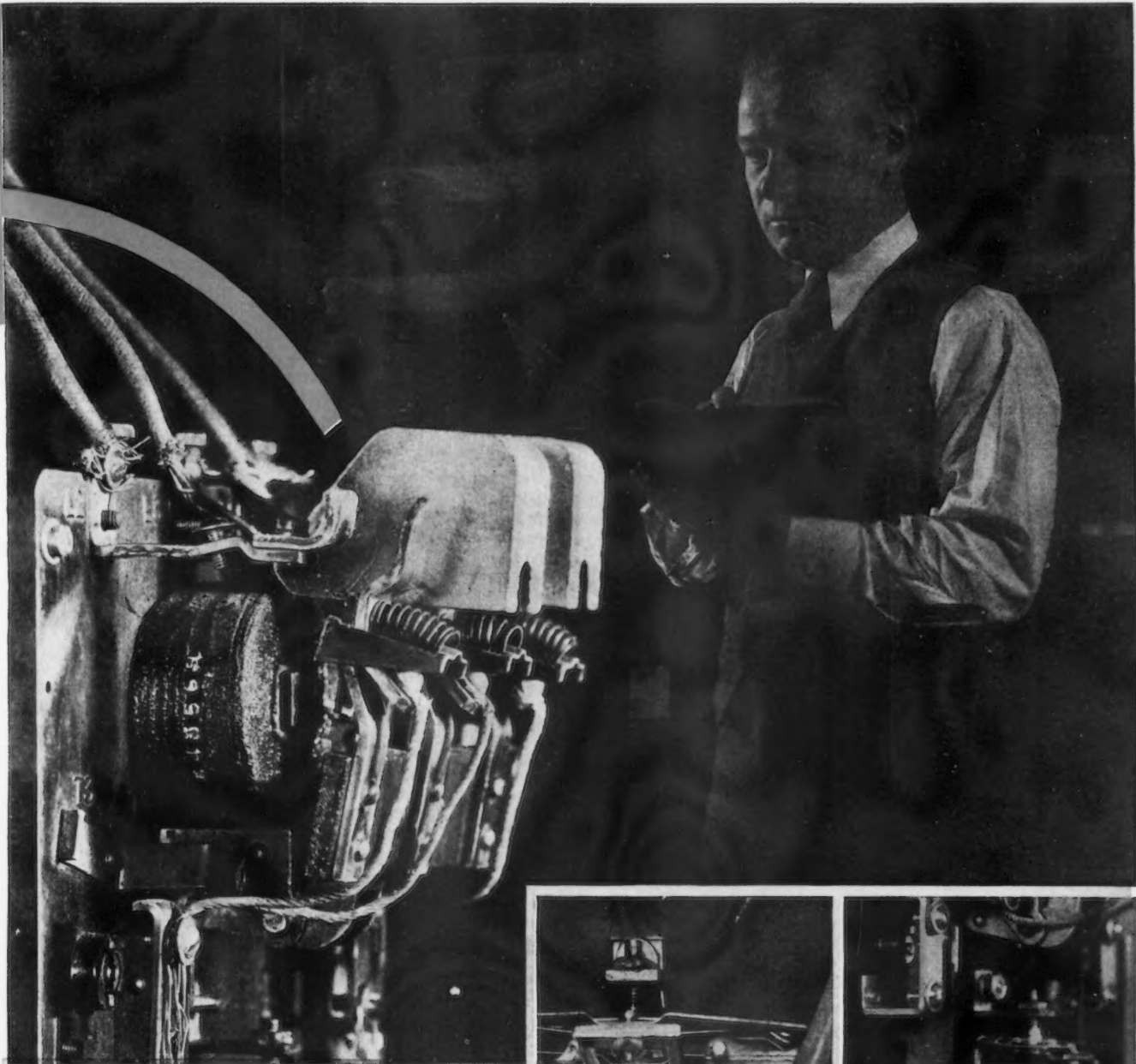
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Oscillograms taken under identical load conditions, illustrating efficiency in arc interruption through use of "Arc Arresters."
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Further Gain in Output in Pittsburgh and Valleys



Rise in Steel Bookings at Slower Rate Than in First Half of February—Heavy Melting Scrap Up 50c. a Ton

PITTSBURGH, Feb. 27.—While moderate improvement in finished steel orders has been reported in the past week, recent gains have not been as marked as was the case during the first half of the month. Demand for sheets and strip steel continues very brisk, but improvement in other finished lines has been rather definitely limited. Railroad car builders have not yet placed the tonnage required for recent purchases by the Van Sweringen roads and, although rolling is already commencing on steel recently placed by the Pennsylvania, the railroads have not yet influenced district operations materially. Additional rail orders are expected to be placed this week, but releases against old contracts have not been received, and the local mill continues to be idle.

Automotive purchases were adversely influenced last week by price developments on strip steel, and the announcement that a leading automobile builder would install its own capacity for making flat rolled steel products proved disturbing. However, the reduction of \$1 a ton in hot-rolled strip, which was filed by a large maker, has now been withdrawn, and similar action is expected to be taken on the lower filing on a specialized type of automobile sheet steel which was filed at the same time. These developments unquestionably forestalled any general advances in sheet and strip prices which might affect second quarter tonnage. If higher prices were filed after March 1, consumers would probably be given 10 days to cover for the entire second quarter, and thus only current spot orders would be affected by an advance.

Demand for structural steel and reinforcing bars continues very quiet, and unusually cold weather throughout the country has brought building operations to an almost complete standstill. It is now believed that it will be May or June before steel mills benefit in a large way from public works loans for building projects. Loans to railroads from this source will, of course, be felt much more quickly.

Steel ingot production in the Pittsburgh district is still rising, but at a slower rate. Output this week is estimated at 28 per cent of capacity. In the Valleys production has risen to

about 55 per cent, while Wheeling district operations are holding at about 80 per cent. Sheet and strip mill schedules are still being expanded, but are reaching a point where further gains are limited by needed repairs on equipment long idle. Tin plate production is holding steadily at about 60 per cent, while finishing mill operations range down to as low as 10 per cent in the case of pipe units.

Pig Iron

The new price of \$17, Neville Island, on basic pig iron became effective Feb. 25, but no sales at the lower level are reported. In fact the market shows no marked change, with business confined almost entirely to small orders.

Refractories

With pig iron and steel production rising sharply, and already approaching the maximum rate of output reached last summer, makers of refractory materials are receiving considerable new inquiry, which they expect to result in orders before the end of March. Mills in this territory have worked off surplus stocks accumulated last year, and most of them have both open-hearth and blast furnaces which must be relined before operation. The code of fair competition for the refractories industry is functioning smoothly, with both large and small producers apparently well satisfied with its provisions. Prices are being well sustained, and the volume of orders has shown a gradual expansion since December.

Bars

Although movement of both merchant and alloy steel bars continues to show improvement, demand for reinforcing material continues very light and shipments are being held up by bad weather throughout the greater part of the country. The Kansas City maker is expected to supply 3000 tons of bars for a job at Boulder Dam, although formal award of the business has not been announced. Engineering charges on reinforcing bars have been revised under the reinforcing steel code, with changes to become effective March 1.

Improvement in sales of merchant bars is now reported rather generally,

although gains are still of a moderate nature. The automotive industry is increasing its requirements steadily, but farm implement manufacturers are still rather quiet, and miscellaneous manufacturing consumers are increasing their needs only gradually.

Semi-Finished Steel

Shipments to non-integrated sheet, strip and tin mills are still increasing, and makers of billets, slabs and sheet bars are being given no opportunity to build up their own inventories. As a result an actual shortage of raw steel exists at some points, and rush orders are the general rule. Consumers are expected to place contracts early for second quarter requirements, as an advance in quotations is freely predicted if sheet and strip prices are correspondingly increased.

Rails and Track Accessories

No sizable rail orders have been reported in this district, although action may be taken this week on a total of 105,000 tons which is wanted by the Baltimore & Ohio, the Erie and the New York Central. Demand for track accessories is quiet. The local rail mill is still idle.

Cold-Finished Steel Bars

A few automotive parts makers are ordering more freely, but makers of cold-finished steel bars in this district can report no marked gain in general business. However, consumers' stocks are being worked off rather rapidly, and warehouse demand is soon expected to be resumed.

Plates and Shapes

No freight car steel has been awarded in this district, and the market in the past week has been without feature. Car builders are expected to place steel requirements for recent large orders within the next week or ten days, and in the meantime some additional business seems to be developing. Demand for plates from other sources is rather quiet, although tank fabricators for the oil industry are slightly busier. The Marietta Mfg. Co., Point Pleasant, W. Va., is reported to be low bidder on two dredges for the United States Engineer at Kansas City, which will require about 4000 tons of plates and shapes. Structural steel awards continue light, and new inquiries in the past week have not been outstanding. Some railroad bridge work is coming before the trade, but this is slow to materialize because of the time required at Washington to make financial arrangements. Fabricated steel prices are still rather chaotic, with a wide range of bids reported on practically all desirable jobs.

Tubular Goods

The pipe business continues to lag behind other finished steel lines, although a rather steady movement of oil country goods is reported. Mills

in this district are running only a day or two each week, and as producers' stocks are adequate to meet the current light demand there is no immediate prospect of improved operations. Standard pipe continues very dull.

Wire Products

Merchant wire products continue very quiet. It is too early for active spring demand to develop, and severe weather has prevented movement of distributors' stocks into consumption throughout the agricultural areas. Demand for manufacturers' wire from the automotive industry is holding up fairly well, although the movement is not comparable to that of sheets and strip steel.

Sheets

No interruption in demand for sheet steel products can be noticed in this district. Heavy automobile tonnage is still being placed, and mills are encountering more and more difficulty in accommodating new tonnage in their March rolling schedules for certain gages and widths. Production is estimated this week at fully 60 per cent of capacity, and many companies could not increase current output without preparing mills long idle for production. Time would not permit this to be accomplished before the end of the current quarter. Many other sheet-consuming lines are more active, notably makers of stoves, steel barrels and electric refrigerators. The reduced price on hot-rolled, pickled in the breakdown, annealed, deoxidized sheets, which was filed last week by a large maker, is reported to have been withdrawn, and the differential of \$2 a ton under light cold-rolled material has thus been maintained. It is still probable that prices on the commoner finishes of sheets may be advanced during the second quarter, but with books for that period scheduled to be opened on Thursday, it is believed that consumers will be given a chance to cover at present levels.

Tin Plate

No particular bulge in specifications is reported, although February releases were sufficient to maintain the present rate of production through the greater part of March. Operations in the industry as a whole are averaging 60 per cent of capacity, and mills are not anxious to boost this rate until spring demand gets under way.

Strip Steel

The price of 1.70c., Pittsburgh, on hot-rolled strip, which was filed with the American Iron and Steel Institute last week by a large maker, has been withdrawn. The figure was in line with a recent reduction of \$1 a ton in the Chicago price, and the market at Chicago has also been advanced \$1 a ton to restore the old differential over Pittsburgh. The confusion arising over these recent price uncertain-

ties had a somewhat disturbing effect on business in the last week, but large makers are again specifying freely against old contracts, and some new tonnage is now being taken. Hot-rolled strip production is well maintained at about 60 per cent of capacity, with cold-rolling mills running at a slightly lower rate. The fact that a large automobile maker is to install its own strip-making capacity has not disturbed this district appreciably, as most of the tonnage lost to the steel industry would come from mills in Detroit and Cleveland.

Coal and Coke

With domestic heating coke still in heavy demand in this and nearby districts, the market continues very tight. By-product plants are having difficulty meeting the demands of distributors, and in view of the fact that their prices are lower than those of beehive makers the Connellsville industry is not benefiting materially. Furnace coke is somewhat more active, and a number of large foundries in the district are taking more coke than was the case in January.

Scrap

Scattered sales of No. 1 heavy melting steel, rails and hydraulic compressed sheets at various plants in the district have again advanced the scrap market 50c. a ton. A sale of No. 1 railroad steel at \$15 preceded heavier purchases of the ordinary No. 1 grade at the same price by a larger consumer. Hydraulic bundles have been sold at \$14.50 to \$14.75, and it is reported that a consumer who paid \$15 for steel is willing to take compressed at the same level. The market on No. 2 is not so active in this district as in the Valleys, and the price paid in the latter territory has not been duplicated here. A railroad recently sold a tonnage of rails at \$14.75, and dealers are now willing to pay this much for corresponding material. Only scattered orders of No. 1 steel are available at less than \$14.50. Railroad specialties are very strong, and some of the low phosphorus grades have been marked up \$1 a ton. Cast scrap is also in heavier demand at higher levels.

January Automobile Production

WASHINGTON, Feb. 27.—The production of motor vehicles in the United States in January of the present year was 161,006 units against 130,087 in January of last year, according to the Bureau of Census. The January, 1934, total was made up of 115,956 passenger cars, 44,729 trucks and 321 taxicabs. Canadian production in January of the present year was 6904 units compared with 3358 in January of last year.

Scrap Higher At Detroit

DETROIT, Feb. 27.—Although steel scrap is being procured in much larger volume than the local steel plant can consume, the demand for it from other steel-making centers is sufficiently strong that prices of most items have advanced 25c. a ton. Hydraulic bundles still are commanding a premium of 25c. a ton over heavy melting steel because of the preference shown for them by the Detroit steel mill. No. 1 machinery cast and automobile cast continue to move freely to users' plants in this district, but quotations are unchanged from a week ago.

Railroad Application For Loan Approved

WASHINGTON, Feb. 27.—The Interstate Commerce Commission has approved an application of the Chesapeake and Ohio Railroad to borrow \$16,876,000 from the Public Works Administration to be used for the purchase of equipment. The equipment to be purchased consists of 800 50-ton steel box cars; 6000 50-ton steel hopper cars; 1000 50-ton steel gondola cars, 15 steel passenger coaches and 11 steel mail and express cars.

The Wisconsin Central Railroad has applied to the Commission for authority to borrow \$115,000 to be used for the purchase of about 1750 tons of 100-lb. rails and 135,000 tie plates.

Increase in Number Of Building Permits

IN January there was an increase of 13.6 per cent in the number of buildings for which permits were issued, but a decrease of 19.4 per cent in the estimated cost of buildings as compared with December. The figures, which pertain to building construction only, to the exclusion of other types of construction, such as highway building, river and harbor work and reclamation projects, were obtained by the Bureau of Labor Statistics from 768 cities having a population of 10,000 or over.

Missouri Pacific To Buy Rails

ST. LOUIS, Feb. 27.—Federal Judge S. Faris has granted the application of the trustees of the Missouri Pacific and subsidiaries to expend \$3,434,971 for improvements in 1934, including rails.

Labor Troubles Disturb Market at Chicago



Steel Output Unchanged at 44½ Per Cent of Capacity—Heavy Melting Scrap Moves Up \$1 a Ton as Local Scarcity Comes to Light

CHICAGO, Feb. 27.—The specter of labor trouble is rising in this district and it is tending to disturb the confidence of business men, who several weeks ago believed that March demand would soar rapidly to a new peak. This feeling of uncertainty is reflected in ingot output, which after rising steadily for a number of weeks has leveled off and stands for the second consecutive week at 44½ per cent of capacity. The Nash plant at Racine, Wis., and the Case works in the same city are closed by strikes and the trouble is spreading to Milwaukee, where the Nash body works is also closed.

The opening of the second quarter contracting period is at hand and evidently price changes for the coming quarter will be few and far between. Hot-rolled strip producers are going back to the \$2 differential between Chicago and Pittsburgh. Sellers of sheets still believe prices too low, but it is conceded that advances will not be made until further study is made of labor rates of pay with the idea in mind that wages and sheet prices must swing up together. The contracting period for pig iron and foundry coke will open at unchanged prices.

Pig Iron

New buying of Northern foundry iron remains on a spot basis from those users who had underestimated needs for the first quarter. Contracting for the second quarter will start the first of March at unchanged prices. Labor troubles are a serious handicap to some foundries, especially to the north of Chicago. Notwithstanding this situation, shipments in February led January by a wide margin and specifications now at hand point to further betterment in the new month.

Cast Iron Pipe

This market is moving slowly in the absence of private work and the slackening activity of CWA projects. John Moore, Evanston, Ill., has been awarded the contract to lay 900 tons in Wilmette, Ill., but has not ordered the pipe. Hammond, Ind., is designing a new filter plant and the Milwaukee filter plant project promises to go ahead. Cold weather is checking most construction jobs.

Reinforcing Bars

Fresh inquiries give this market a more cheerful outlook. For several weeks business has been dragging and shop output has been slowly dropping. Illinois is taking bids on 1000 tons of paving work, and Indiana, with an addition at a State teachers' college and paving at Indianapolis, is contributing to new tonnage now in sight. The proposed Campbell's soup plant addition at Chicago is one of the very few private projects up for figures. The Illinois legislature has authorized the 1935 World's Fair, for which some bars will be needed for new construction.

Hot-Rolled Strip

The recent reduction of \$1 a ton at Chicago has been withdrawn and the old \$2 differential above Pittsburgh has been reestablished. Hot strips are now quoted at 1.85c. a lb., Chicago, and cooperage stock at 1.95c. Demand for hot-rolled strips is stepping upward as automobile production expands.

Sheets

Strip departments of sheet mills are running near capacity but the more common products are suffering because of lack of demand. Production of the plain sheet classifications does not exceed 30 to 35 per cent of capacity in spite of greater consumption by the roofing industry. Prices remain strong, but the trade still holds to the impression that advances will not go into effect unless mills increase wages at the same time.

Wire Products

Orders continue to increase, but aggregate volume is still well behind expectations. Business in the South and Southwest is making fair progress, but cold weather in the North has held back any marked recovery which might otherwise have come by this time. Many small manufacturers give indications of greater activity, thereby leading sellers to the conclusion that most of the tonnage rushed out in December has been digested. The bed trade is doing especially well and shipments to automobile plants are still moving upward. Mills report a satisfactory volume of business coming in from CWA projects.

Plates

Orders remain scarce. There is a lack of tonnage orders from the oil country and car shops are not yet ready to take steel against the business recently placed with them. The Pittsburgh-Des Moines Steel Co. will buy 175 tons for a derrick hull, and mills will soon be making shipments against the tonnages needed for dams on the Mississippi River.

Structural Material

Awards are almost negligible and fresh inquiries are very unsatisfactory from the point of view of aggregate tonnage. Colorado has a small bridge program and similar undertakings are under way in Illinois, Minnesota and Nebraska. The Illinois Central is withholding orders for two bridges pending receipt of Federal funds, and there is now some doubt that the outer bridge, Chicago, will be sanctioned as a project on which the Government will advance money.

Rails and Track Supplies

Several Western railroads have ordered an aggregate of about 10,000 tons of rails, and rolling mills have settled down to a moderate schedule that will be maintained for several months. There is still no indication that total purchases will exceed by more than about one-half the estimate made last fall. Orders for accessories are turning up rather sharply.

Bars

This market is still getting excellent support from automobile plants notwithstanding that some manufacturers, such as Nash at Racine, Wis., are having labor troubles. Farm implement makers are operating near capacity on tillage machinery and their other departments are busier. New orders for bars now being received from day to day clearly show that most stocks built up in December have been well liquidated.

Coke

March prices will be unchanged at \$8.50 a ton, ovens, for delivery outside of the switching district and at \$9.25 for delivery in the switching district. February shipments topped the January movement by not less than 40 per cent.

Scrap

Heavy melting steel has reached a new high at \$12 a ton, delivered consumers' yards. Supplies close to Chicago are well absorbed as steel mills, enjoying higher operations, call for increasing supplies. Dealers are paying \$11.50 to \$12 for heavy melting steel and some brokers are reaching out into what is normally the St. Louis market, where they are offering prices that figure \$12, delivered Chicago. The entire situation is set up for an influx of scrap from outlying areas as soon as the weather moderates. There is a steady increase of the movement of scrap to foundries.

Mills Get Releases of Car Steel In Philadelphia District



Mills Also Get Specifications for Pennsylvania Railroad's Electrification Project —Ingot Output Up Two Points

PHILADELPHIA, Feb. 27.—The market in this district has reflected a mild improvement in miscellaneous lines the past week and open-hearth operations have advanced another two points to 29 per cent of capacity. Sentiment also is increasingly hopeful. The Pennsylvania Railroad has begun to give releases on steel for its 6500-car program and its Wilmington - Washington electrification project, and more sheet and strip steel requirements have been placed. In these two latter lines and in tin plate, operations are well up to capacity for the remainder of the current quarter. General business in the plate market, while not large, has picked up, while fabricators are looking for a revival of bookings, based on estimates being made. Public works projects still are slow in reaching mills but promise to develop into sizable orders soon.

Pig Iron

No changes in prices for the second quarter will be made, according to present plans of producers, despite higher costs and narrow profits. There has been a healthy improvement in shipments of foundry grades. Outstanding consumers are cast iron pipe foundries and radiator manufacturers. Shipments in February exceeded by 40 to 50 per cent those made in January. An eastern Pennsylvania blast furnace was banked last week and is shipping from stock.

Plates, Shapes and Bars

The Pennsylvania Railroad has begun to give releases on orders in connection with its 6500-car program and expects to complete remaining releases on the entire requirements, estimated at 72,000 tons, at a comparatively early date. Releases also continue to be made in connection with this carrier's program of electrification between Wilmington and Washington. Plate mills reported increased business the past week from miscellaneous sources and fabricators say that there is considerable estimating being done, which may develop soon into good-sized tonnage demands. The Department of Property and Supplies, Commonwealth of Pennsylvania, will take bids on March 5 for 29,300 channel posts to be made from rail steel. The

material, to range from 6 ft. 6 in. to 11 ft. in length, is to be used for highway sign posts. They will call for 300 tons of steel. Three highway bridges, two in New Jersey and one in Pennsylvania, will require 1500 tons of structural material.

Sheets

Some fair-sized tonnages of sheets have been placed in this district the past week. While the major portion has been for automotive requirements, there also has been an improvement in orders for the commercial grades. Mills making wide sheets and strips are booked up to capacity for the remainder of the current quarter. While there still is talk of increasing second quarter prices on sheets and strips, indications are that present levels will be continued. The Pennsylvania Railroad has released some of its sheet

Steel Demand Slightly Better in South

BIRMINGHAM, Feb. 27.—The pig iron market continues inactive, with only a restricted amount of new business, which is mostly in small lots. Neither new tonnage nor shipments this month have been up to expectations. Books will be opened March 1 for the second quarter.

It is not likely that there will be any change in the present price of \$13.50 at the beginning of the quarter. Active stacks remain at ten, no change having taken place during the month.

Pipe demand is still backward and February business has been only about three-fourths of January tonnage.

Steel

There was a slight improvement in demand last week for heavier products, such as plates and structural shapes. Some additional rail tonnage was also booked and this insures steady operations of the Ensley rail mill for some time longer.

Twelve open-hearths were worked last week, and the same number is scheduled for this week.

requirements for the 6500 cars it is to build in its own shops. Radio and stove manufacturers are more active in the market.

Warehouse Business

Jobbers report that February business has been about on a par with that of January. There was a slight improvement the past week. Prices remain unchanged.

Imports

The following iron and steel imports were received here last week: Two thousand tons of chrome ore from Portuguese Africa and 18 tons of the same product from British South Africa; 21 tons of structural shapes and 5 tons of steel bars from Belgium, and 14 tons of steel rods, 6 tons of steel bars and 2 tons of steel tubes from Sweden.

Scrap

The market is somewhat more active and one mill which has been holding up shipments has resumed taking them. While the top price for No. 1 heavy melting remains unchanged, it is reported that a nearby mill last week took a substantial tonnage from one source at about 25c. above this level. No. 2 heavy melting still is quotable at \$9.50 but, with weather conditions hampering yard activity, the trend points upward. The general tone of the market also has been strengthened by the gradual rise in steelworks operations and the export demand.

Buffalo Operations Are Higher

BUFFALO, Feb. 27.—Steel operations jumped again when the Lackawanna plant of the Bethlehem Steel Corp. increased the number of its active open-hearths to 12. Republic Steel Corp. is operating five open-hearths and the Seneca sheet division of Bethlehem continues on an 80 per cent basis. Wickwire-Spencer Corp. is operating one open-hearth. Apparently no sizable structural or reinforcing bar contracts were closed during the week. Warehouse business continues good.

Pig iron producers will open books for second quarter delivery March 1. In the meantime no great amount of tonnage has been booked, but there have been a few sales here and there of 200 and 300-ton lots and a steadier flow of carload orders.

Scrap dealers believe that the next railroad lists closing at Pittsburgh will bring close to \$15 for No. 1 heavy melting steel, which makes the local quotations firm at present figures. Sales of No. 1 cupola cast have been made at \$11.50 to \$12, and railroad malleable has sold at \$13.50. Stove plate is firm.

February in Sharp Gain Over January at New York



Increase Over Previous Month Particularly Marked in Tin Plate—Van Sweringen Car Steel Still Pending

NEW YORK, Feb. 27.—February steel bookings were generally much better than those of January, in the case of some selling offices from two to three times as heavy. Improvement was particularly marked in tin plate specifications. Building steel has been a negligible factor for several weeks because of delays in the placing of public projects. Railroad tonnage is still largely prospective.

No action has yet been taken on the award of steel for the Van Sweringen cars. The report that these railroads might purchase the steel direct is not credited because the code does not grant special terms to railroads except on material that they fabricate in their own shops. A more creditable report is that the Van Sweringen lines will ask the car builders to purchase steel at points which will yield them the longest hauls. After all, the cost of the equipment has been settled with the distribution of orders among equipment builders and the only way in which the roads can capitalize on the orders is by making the most out of the steel traffic that they will yield.

Mason & Hanger Co., Inc., New York, is the low bidder on the Thirty-eighth Street tunnel in this city, calling for 1700 tons of plates, 5700 tons of structural steel, 850 tons of reinforcing bars and 600 tons of stainless steel. James Stewart & Co., Inc., New York, has been awarded the general contract for the Midtown post office, calling for 12,000 tons of structural steel. Recent changes in the personnel of the Triborough Bridge Authority, New York, may result in the redesign of the structure. About 12,000 tons for the towers has already been placed, of which 25 per cent is now in the shop of the fabricator. Radical changes in the plans might not materially disturb the tower construction, but would probably hold up work on the rest of the structure for another year. According to the present design, from 30,000 to 40,000 additional tons of steel remain to be placed for the bridge. This tonnage would be cut down considerably if the structure were redesigned.

Export business continues to improve, particularly in tin plate, pipe and wire products.

Pig Iron

Severe weather conditions throughout the Metropolitan and New Eng-

land districts has forced melters to curtail operating schedules, and, consequently, buying interest has been

at a low ebb. Current inquiries generally average less than a carload, and bookings are limited to specialties and specification iron required by day-by-day melts. Sales last week approximated 1400 tons, as compared with 1700 tons in the preceding seven-day period, and 2000 tons sold two weeks ago. Furnaces have not yet expressed any intention of asking higher prices for second quarter delivery, and hence buyers are not inclined to consider forward requirements.

Reinforcing Steel

Buying in this district is again in low volume, as much of the tonnage involved in Government-financed proj-

The Day Is Here!



A recent survey shows that the average age of forge shop equipment is the greatest of all classes of production machinery, without exception. No other type of machine is so in need of replacement. Hammers are long-lived—they have to be to stand the gaff; but they do wear out, and obsolescence of design, which steadily makes them unfit for economical production, has operated more rapidly than usual in recent years.

A day creeps upon you when your hammers can profitably be retired—from the front lines, at least—and replaced by modern equipment. That day is here now! If you have not realized it, write at once for full information on improved type of Erie steam drop hammers; Erie board drop hammers; Erie trimming presses.

ERIE FOUNDRY COMPANY
ERIE, PENNA., U. S. A.

DETROIT:
CHICAGO:

326 CURTIS BUILDING
549 WASHINGTON BLVD.

INDIANAPOLIS: 326 POSTAL STATION BUILDING
PARIS, FRANCE: 8 RUE DE NOGROY



ects is being delayed. A portion of the bar requirements of an Academy gymnasium at West Point, N. Y., has been awarded to Kalman Steel Corp., and miscellaneous highway awards in Connecticut and Pennsylvania aggregate about 300 tons. Local distributors are now submitting tenders for 850 tons required by the Midtown, New York, vehicular tunnel.

Scrap

Prevailing blizzards along the Atlantic seaboard have seriously interfered with scrap loadings, but fresh mill demands generally have been less urgent than brokers had expected. Some shipments have been released, and Bethlehem is purchasing at scattered points, but most other mills are avoiding active market operations. This attitude, of course, is preventing anticipated price strength. No. 1 machinery cast is being bought in limited quantities at \$8.50 for Bridgeport, N. J., delivery, and recent stove plate purchases for Bayonne, N. J., were made at \$6 a ton. Existing bookings for foreign delivery are very satisfactory, and Japanese, Polish, Italian and English buyers continue to be interested in new commitments.

Mills Turn Down Orders In Cincinnati Area

CINCINNATI, Feb. 27.—With rolling schedules filled well into March, district mills have refused some round tonnages because of inability to guarantee delivery. New business in all types of sheets, except electrical sheets, is at a near capacity rate. Demand from automotive sources is unabated, while stove manufacturers, electrical refrigerator builders and steel drum manufacturers are becoming steadily more active in the market. Jobbers, however, show relatively no interest in new purchases, but this is expected to change with improvement in building business. Steel production rates have been set at about 60 per cent for this week, although mills indicate that this rate may be exceeded if tonnage continues to mount.

Pig Iron

Melters are maintaining a high rate of specifications against contracts in eager effort to complete commitments before the end of the quarter, but new ordering is negligible. Completion of the foundry code has eliminated much speculation from the market, but the trade still displays some uncertainty and is looking for the March 5 meeting in Washington to dispel remaining doubts. Foundry operations are at about one-third of normal production.

Scrap

Mill activity is contributing a strong undertone to the district scrap market despite the lack of buying interest.

Steel Demand Still Rising In Cleveland District



Sheet and Strip Mills Assured Full Operating Through March — Ingot Output Increases to 67 Per Cent

CLEVELAND, Feb. 27.—Demand for finished steel continues to show an upward trend, with the automotive industry still taking the bulk of the tonnage. Merchant bars have become more active, and business in alloy steel bars and billets has increased rather sharply. Good orders are being placed for automobile rim sections. Sheet and strip mills are assured practically full operations through March with the tonnage on their books for shipment before April 1, and some mills are turning down orders for cold-finished sheets and enameling stock that require considerable time in processing, as their capacities for these grades are fully taken up for March.

Ingot output in the Cleveland-Lorain territory increased two points this week to 67 per cent of capacity by the addition of an open-hearth furnace in Lorain.

Specifications for the 175,000 tons of steel for the cars for the Van Sweringen railroads are being prepared and are expected to be issued to the mills late this week or early next week. The railroads have delayed in signing of contracts for cars, pending receipt of Federal funds allocated for their construction. Rail mills have extended for 30 days the present \$36.37½ price on rails which was to expire March 1, but have not yet changed the June 30 deadline shipping date for rails taken at that price. The Chesapeake & Ohio placed 600 tons of screw spikes with four or five makers.

With no announcement of price changes, there is no expectation of an advance on any product for the second quarter and producers are preparing to open their books for that delivery March 1. Scrap prices have again advanced.

Pig Iron

Lake furnaces will open their books for the second quarter at present prices March 1. However, they do not expect a great deal of contracting will immediately follow, although foundry stocks, which were largely increased by shipments against expiring contracts in December, have been materially reduced. February shipments will show a gain of about

35 per cent over January and a further increase is looked for in March, owing to the increasing demand from the automotive industry, which is reflected in larger shipping orders. New demand for early shipment shows some gain.

Bars, Plates and Shapes

Demand for merchant bars has gained. While most of the business is coming from the automotive industry, some new demand has developed from makers of road machinery. Inquiry is now coming out for April shipment against which mills will not quote until March 1. Structural shapes and plates remain quiet. The War Department has readvertised the Huron breakwater job requiring 2000 tons of steel piling, and the Pennsylvania Railroad dock work in Cleveland will take 180 tons. A building at Wright Field, Dayton, requiring 340 tons, has been placed, and another building there will take 400 tons. A Toledo hospital will take 200 tons. Reinforcing bars are dragging, owing to delays in placing public work. A Firestone service station in Cleveland probably will take less than 100 tons.

Sheets

Specifications from the automotive industry continue to come out in good volume and some producers turned down tonnage the past week, being unable to take orders except for hot-rolled material for shipment before April 1. Others, while having good order books, can still take business for March shipment. With no announcement of price changes, mills expect to open their books March 1 for the second quarter at present prices.

Strip Steel

Orders from the automotive industry continue heavy, and many consumers are crowding mills for shipment. Round-tonnage orders for hot-rolled material continue to come from cold rolling plants. Several of the cold rolling mills have their schedules well filled for March shipment. A \$1 a ton price reduction on hot-rolled strip filed by a Pittsburgh district maker last week is reported to have been withdrawn and the former Chicago base, recently reduced \$1 a ton,

has been restored. With the first quarter prices restored at the two basing points, a change for the second quarter is not expected. Neither is a change looked for on cold-rolled strip.

Bolts, Nuts and Rivets

Demand for bolts and nuts continues to gain. While most of the business is from the automotive industry, requirements of other consumers have increased. Some makers state that their February business will be the best in several years. It is expected that present prices will be continued through the second quarter, although production costs will advance when present stocks of raw material are exhausted. Demand for rivets has improved.

Scrap

Another price advance of 25 to 50c. a ton has been made on leading steel-making and blast furnace grades, although there has been no new buying by consumers to test prices. In view of the improved outlook in the steel industry, dealers are refusing to sell scrap at the recently prevailing prices and brokers, in some cases, are being forced to pay prices that are higher than those at which they sold the scrap.

Melt Improves in St. Louis District

ST. LOUIS, Feb. 27.—There has been a considerable pick-up in orders for pig iron, some of the business coming from firms who already had ordered as much iron as they could use during first quarter. In the Tri-cities, the melt is said to be about three times what it was at this time last year. In the agricultural implement manufacturing sections of Illinois, there also has been a marked increase in the melt. The improvement in St. Louis proper seems to be less marked.

The fabricated steel for Bonnet Carre bridge for the Louisiana & Arkansas Railway, amounting to 2300 tons, has been awarded to the McClintic-Marshall Corp. St. Louis will take bids in March for a conduit, requiring 46,895 lin. ft. of 60-in. pipe, 11,015 lin. ft. of 54-in. pipe and 9985 lin. ft. of 46-in. pipe, to be either electric welded steel or reinforced concrete.

Scrap prices are unchanged but strong, although no important new buying by consumers has developed.

Correction

A new base price filing of rail-steel strip at \$1.65 per 100 lb., base, Chicago, became effective Feb. 18 instead of Feb. 8 as previously announced.

Cast Iron Pipe

Smithfield, R. I., plans water pipe line system. Fund of \$156,000 is being secured through Federal aid, including 500,000-gal. steel standpipe and pumping station. W. B. Hall, 1551 Smith Street, North Providence, R. I., is engineer.

Port Hope, Mich., plans 2-mile water pipe line. Cost \$25,000 with pumping station and water purification plant. Financing has been arranged. McCordic, Stadler & Larson, Pontiac, Mich., are engineers.

Martin, Ky., plans about 18,000 ft. for water supply. Fund of \$43,000 has been arranged for this and pumping station, with 100,000-gal. elevated steel tank and tower. Frank S. Parrigan, Paintsville, Ky., engineer.

Big Wells, Tex., plans water pipe line system. Fund of \$30,000 has been arranged, including pumping equipment and elevated steel

tank and tower. F. E. Hess, 401 First Avenue, Dallas, Tex., is engineer.

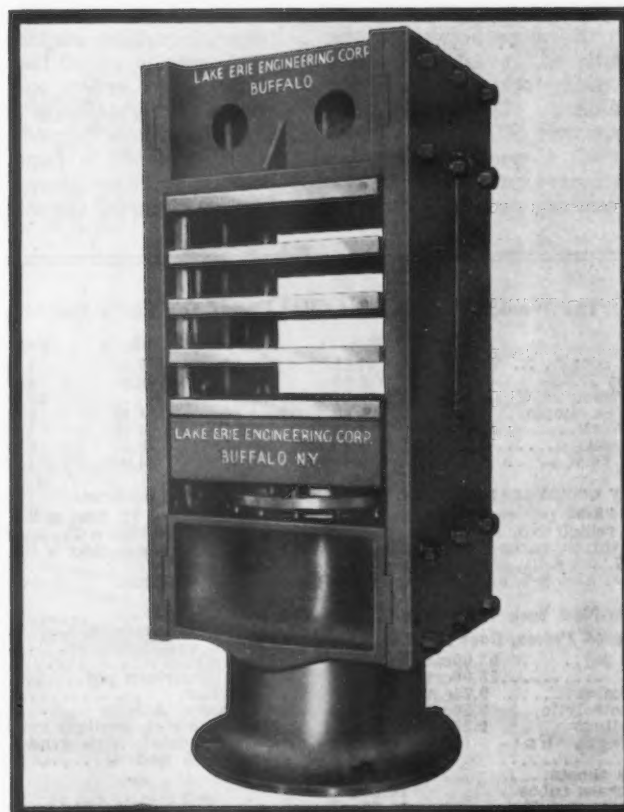
Lynchburg Foundry Co. is low bidder on 2300 tons for Springfield, Ill., and on 30,900 ft. of 12-in. for Cook County, Ill.

Blue Springs, Mo., plans 6-in. centrifugal pipe line from Independence, Mo., to city for water supply. Cost \$104,000. Fund is being arranged through Federal aid. Burns & McDonnell Engineering Co., 107 West Linwood Boulevard, Kansas City, Mo., consulting engineers.

United States Engineer Office, Postal Telegraph Building, Kansas City, Mo., asks bids until March 21 for 56,300 ft. of 4 to 16-in. for water system at construction camp for Fort Peck dam project, about 25 miles from Glasgow, Mont.

Safford, Cal., plans pipe line from Bonita Canyon for water supply, with smaller lines in city for distribution. Special election has been called on March 20 to vote bonds for \$133,000 for project. Total cost \$184,000, remainder of fund to be secured through Federal financing.

LAKE ERIE'S Latest Offering



HYDRAULIC STEAM PLATEN PRESS

Plate Frame Design

Gives Maximum Rigidity

Greatly Reduces Steam Consumption

Assures Uniformity of Cure

Avoids Possibilities of Nuts Slackening

Improved Method of Hanging Platens

LAKE ERIE ENGINEERING CORP.

BUFFALO, N. Y.

Spelter, Lead and Copper Prices Remain Unchanged for Third Consecutive Week

Tin at New York Slightly Higher as London Prices Advance and Dollar Declines—Fair Lead Bookings—Copper Inactive

NEW YORK, Feb. 27.—Consumers of electrolytic copper displayed practically no interest in the open market last week, and scattered outside offerings at shaded price levels failed to stimulate buying. The present market is nominally 8c. a lb., Connecticut valley, for custom interests, and mine producers continue to adhere to 9c. for other than inter-company transactions. As none of the provisions of the revised code will affect the marketing of copper, consumers are generally indifferent to the code hearings which are scheduled to begin today. Buying sentiment abroad continues to be exceedingly good, and prices tend to range between 8.10c. and 8.15c. a lb., c.i.f. usual Continental ports. European stocks declined 12,000 tons in January. Domestic stocks, however, advanced 5500 tons in January as a result of poor sales coupled with an increased production of 500 tons of secondary and 2500 tons of

primary metal. Internal deliveries were 31,000 tons in January, compared with 25,000 tons in December, and foreign deliveries totaled 66,500 tons, against 68,500 tons in December. World refinery stocks now stand at 635,500 tons, most of which is located in the United States. World stocks a year ago totaled about 750,000 tons.

Tin

The sharp rise in tin plate production has not yet materially influenced the tin market, and trading is still spotty and in disappointing volume. Prices steadied at higher levels during the week, and with sterling at \$5.06½ today, importers disposed of several good parcels at 52.15c. a lb., New York. Most sellers are asking premiums of 2½ points a month for delivery positions beyond March. Consumer demands in London are fairly heavy, and prices there are generally firm by virtue of the steadily improv-

ing statistical position. Postings on first call today were £227 2s. 6d. for spot and £226 17s. 6d. for future standard, and £229 15s. for Straits at Singapore.

Zinc

Influenced by a firm trend in the Tri-State ore fields and an improved consumptive demand, spelter quotations are firmly established at 4.40c. a lb., East St. Louis, and 4.75c., New York. Leading sellers are willing to entertain business into June at 4.40c., but they are asking premiums for delivery positions further forward. Last week's bookings totaled over 2000 tons, against 2000 tons in the preceding period and 4600 tons sold a fortnight ago. Joplin concentrates are unchanged at \$30 a ton for all grades, and stocks declined to 13,650 tons as a result of a scheduled curtailment of output and inclement weather. If additional curtailments materialize, visible stocks should rapidly decline, thereby preventing any sharp price weakness. Such a situation would naturally be reflected in stronger quotations for refined metal.

Lead

The market is adequately supported by steady consumer demand, and an improved statistical trend is favorably influencing sentiment. Practically all consuming outlets are represented in current trading, which is mostly confined to March carlots. Most sellers are currently able to strike a fair balance between daily bookings and ore intakes, but the aggregate excess smelter output is still large enough to discourage any immediate attempt to advance prices. Quotations for prompt and March deliveries are, therefore, firm at 4c. a lb., New York, and 3.90c., St. Louis. Some April tonnage has been quietly placed, February is fully sold at 26,500 tons, and sellers anticipate additional March commitments of approximately 11,000 tons. January shipments were 1094 tons daily, against 841 tons daily in December. The January rate was well above the average daily shipments for 1933 and 1932, and almost equaled the rate established in 1931. Total January shipments showed a marked increase, being about 8000 tons greater than December releases, and production, both secondary and primary, declined sharply. Nevertheless the production-shipment unbalance was still sufficiently large to result in a stock increase of 4000 tons.

The Week's Prices. Cents Per Pound for Early Delivery

	Feb. 21	Feb. 23	Feb. 24	Feb. 26	Feb. 27
Electrolytic copper, N. Y.*	7.75	7.75	7.75	7.75	7.75
Lake copper, N. Y.	8.00	8.00	8.00	8.00	8.00
Straits tin, Spot, N. Y.	52.37½	52.45	....	52.50	52.15
Zinc, East St. Louis.	4.40	4.40	4.40	4.40	4.40
Zinc, New York.	4.75	4.75	4.75	4.75	4.75
Lead, St. Louis.	3.90	3.90	3.90	3.90	3.90
Lead, New York	4.00	4.00	4.00	4.00	4.00

*Refinery quotations; price ¼c. higher delivered in Connecticut.

Aluminum, 98-99 per cent, 22.90c. a lb. delivered; new No. 12, 20c. a lb., delivered. Aluminum, remelt No. 12 (alloy), carload lots delivered, 15.50c. a lb., average for week. Nickel electrolytic cathode, 35c. a lb., delivered; shot and ingot, 36c. a lb., delivered. Antimony, 7.20c. a lb., New York. Brass ingots, 85-5-5-5, 8.00c. a lb., New York and Philadelphia.

From New York Warehouse

Delivered Prices, Base per Lb.

Tin, Straits pig.	53.00c. to 54.00c.
Tin, bar.	55.00c. to 56.00c.
Copper, Lake.	9.75c. to 10.50c.
Copper, electrolytic.	9.50c. to 10.00c.
Copper, castings.	9.25c. to 10.25c.
*Copper sheets, hot-rolled	15.00c.
*High brass sheets.	13.75c.
*Seamless brass tubes.	16.25c.
*Seamless copper tubes.	16.25c.
*Brass rods.	12.25c.
Zinc slabs.	5.75c. to 6.75c.
Zinc sheets (No. 9), casks	9.75c. to 10.00c.
Lead, American pig.	4.75c. to 5.75c.
Lead, bar.	5.75c. to 6.75c.
Lead, sheets.	7.75c.
Antimony, Asiatic.	8.75c.
Alum., virgin, 99 per cent, plus.	23.30c.
Alum., No. 1 for remelting, 98 to 99 per cent.	18.00c. to 19.00c.
Solder, ½ and ½.	32.00c. to 33.00c.
Babbitt metal, commercial grade.	25.00c. to 60.00c.

*These prices are also for delivery from Chicago and Cleveland warehouses.

From Cleveland Warehouse

Delivered Prices per Lb.

Tin, Straits pig.	56.25c.
Tin, bar.	58.25c.

Copper, Lake.	9.00c.
Copper, electrolytic.	9.00c.
Copper, castings.	8.75c.
Zinc, slab.	5.75c. to 6.00c.
Lead, American pig.	5.00c. to 5.25c.
Lead, bar.	8.00c.
Antimony, Asiatic.	9.00c.
Babbitt metal, medium grade.	19.50c.
Babbitt metal, high grade.	61.75c.
Solder, ½ and ½.	33.75c.

Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible.	6.50c.	7.25c.
Copper, hvy. and wire.	6.25c.	7.00c.
Copper, light and bottoms.	5.25c.	6.25c.
Brass, heavy.	3.50c.	4.25c.
Brass, light.	3.00c.	3.625c.
Hvy. machine composition.	4.75c.	5.625c.
No. 1 yel. brass turnings.	4.25c.	5.125c.
No. 1 red brass or compos. turnings.	4.25c.	5.25c.
Lead, heavy.	3.00c.	3.625c.
Zinc.	2.50c.	3.125c.
Cast aluminum.	9.50c.	11.25c.
Sheet aluminum.	12.25c.	13.50c.

Gain in General Motors Overseas Sales

OVERSEAS car and truck sales of General Motors Corp. for the month of January totaled 10,317 units, representing an increase of 84 per cent over the total for January, 1933, and an increase of 71.5 per cent over the total for January, 1932.

Reinforcing Steel

Awards 3425 Tons—New Projects
6975 Tons

AWARDS

State of Connecticut, 150 tons, highway and structures, to Truscon Steel Co.

West Point, N. Y., 180 tons, gymnasium to Kalman Steel Corp.

Erie County, Pa., 125 tons, highway bridge, to Patterson-Leitch Co.

Treichlers, Pa., 240 tons, Pennsylvania State highway bridge, to Kalman Steel Corp.

Wilmington, Del., 100 tons, office building, to Concrete Steel Co.

Washington, 750 tons, Calvert Street bridge, to Hudson Supply & Equipment Co., Washington.

Milwaukee, 160 tons, building, to Concrete Steel Co.

Los Angeles, 230 tons, paving, to Pacific Coast Steel Corp.

Ventura County, Cal., 260 tons, State bridge, to Truscon Steel Co.

Bakersfield, Cal., 300 tons, school, to Kyle Steel Construction Co.

San Diego, 350 tons, brewery, to W. J. Bailey.

Boulder Dam, 175 tons, to Soule Steel Co.

NEW REINFORCING BAR PROJECTS

Holyoke, Mass., 100 tons, post office.

New York, 530 tons, bars and mesh for post office annex; James Stewart & Co., Inc., general contractor. Subletting expected within the next week.

New York, 850 tons, Thirty-eighth Street tunnel, Mason & Hanger Co., Inc., general contractor; subletting expected in three weeks.

Indianapolis, tonnage being estimated, paving and culverts.

Terre Haute, Ind., tonnage being estimated, building at State Teachers College.

State of Illinois, 1000 tons, highway work.

Chicago, 700 tons, project for Sanitary District.

Chicago, tonnage being estimated, addition to Campbell Soup Plant.

Bonneville, Ore., 2300 tons, dam.

Mare Island, Cal., 1000 tons, causeway at Navy Yard.

Oakland County, Cal., 560 tons, bridge.

Oakland, Cal., 500 tons, tunnel ventilating plants; bids March 28.

Sacramento County, Cal., 215 tons, State bridge; bids March 4.

Railroad Equipment

Lehigh Valley is inquiring for several 4-3-4 type locomotives.

Gulf, Mobile & Northern is in the market for 50 gondola and 175 box cars.

Boston & Maine is inquiring for 20 passenger coaches.

Union Pacific has ordered air-conditioning apparatus for 38 cars from Pullman Car & Mfg. Corp.

Chesapeake & Ohio has placed air-conditioning apparatus for four lounge cars with Pullman Car & Mfg. Corp.

Seaboard Air Line has awarded air-conditioning apparatus for three cars to Pullman Car & Mfg. Corp.

Pipe Lines

Benedum-Trees Oil Co., Benedum-Trees Building, Pittsburgh, plans welded steel pipe line from natural gas properties to Clyde,

N. Y. Similar franchises are being obtained at about 15 communities in neighboring district, where branch lines will be built. Work will begin early in spring. Cost about \$150,000.

Shamrock Oil & Gas Co., Amarillo, Tex., plans extensions in steel pipe line system in connection with expansion and development of natural gas and oil properties in Moore and Gray counties, Panhandle district. Entire program will cost close to \$250,000.

W. Moore & Son, Stamford, Tex., care of W. D. Bowren, Lubbock, Tex., engineer, will soon begin construction of new 8-in. welded steel pipe line from natural gas fields, Brown County, to Kerrville, Tex., and vicinity, about 140 miles. Number of small distribution lines will be built for supply at communities along route. Cost about \$1,000,000.

American Michigan Pipe Line Co., Muskegon, Mich., affiliated with Muskegon Gas Co.,

same place, both subsidiaries of American Light & Traction Co., New York, is considering branch pipe lines in conjunction with main steel welded trunk line from natural gas properties in Austin Township, Mecosta County, Mich., soon to be built to Muskegon, including White Cloud, Fremont, Brunswick, Reeman and neighboring points. Muskegon line is scheduled for completion early in July. Cost over \$500,000.

United States Engineer Office, Missouri River Division, Postal Telegraph Building, Kansas City, Mo., asks bids until March 14 for 2 to 8-in. steel pipe for gas system at construction camp site, Fort Peck dam project, about 25 miles from Glasgow, Mont.

Board of Public Service, St. Louis, will receive bids March 16 for building pressure conduit No. 2 from Stacy Park reservoir to Grand Avenue and Eichelberger Street, requiring 67,895 lineal ft. of 48, 54 and 60-in. pipe. Specifications call for either concrete or electric welded steel pipe.

Send for your copy of this **NEW WYCKOFF STEEL CHART**

WYCKOFF DRAWN STEEL COMPANY
MILLS AT AMBRIDGE, PA. AND CHICAGO, ILL.
General Offices: Ambridge, Pennsylvania
SALES OFFICES IN THE PRINCIPAL CITIES

You will find it invaluable in selecting the right grade of cold drawn steel for any specific purpose.

WYCKOFF DRAWN STEEL CO. . . . Ambridge, Pa.

Please send the new WYCKOFF STEEL CHART

Name _____ Title _____

Company _____

City _____ State _____

Prices of Finished and Semi-Finished Steel, Coke, Coal, Cast Iron Pipe

BARS, PLATES, SHAPES Iron and Steel Bars

Soft Steel	Base per Lb.
F.o.b. Pittsburgh mill	1.75c
F.o.b. Chicago or Gary	1.80c
Del'd Philadelphia	2.04c
Del'd New York	2.08c
F.o.b. Cleveland	1.80c
Del'd Detroit	1.90c
F.o.b. Buffalo	1.85c
F.o.b. Birmingham	1.90c
F.o.b. cars dock Pacific ports	2.30c
F.o.b. cars dock Gulf ports	2.15c

Roll Steel

(For merchant trade)	
F.o.b. Cleveland	1.70c
F.o.b. Chicago	1.70c
F.o.b. Gary	1.70c
F.o.b. Pittsburgh	1.65c
F.o.b. Buffalo	1.75c
F.o.b. Birmingham	1.80c

Billet Steel Reinforcing

(Cut lengths as quoted by distributors)	
F.o.b. P'gh mills	1.90c
F.o.b. Birmingham	1.95c
F.o.b. Buffalo	1.95c
F.o.b. Cleveland	1.85c
Del'd Detroit	2.05c
F.o.b. Youngstown	1.95c
F.o.b. cars dock Pacific ports	2.45c
F.o.b. cars dock Gulf ports	2.30c
F.o.b. Chicago	1.95c

Roll Steel Reinforcing

(Cut lengths as quoted by distributors)	
F.o.b. Pittsburgh	1.75c
F.o.b. Cleveland	1.80c
F.o.b. Chicago	1.80c

Iron

Common iron, f.o.b. Terre Haute, Ind.	1.60c to 1.75c
Refined iron, f.o.b. P'gh mills	2.75c
Common iron, del'd Philadelphia	1.85c
Common iron del'd New York	1.93c

Steel Car Axles

F.o.b. Pittsburgh	2.50c
F.o.b. Chicago	2.50c

Tank Plates

Base per Lb.	
F.o.b. Pittsburgh mill	1.70c
F.o.b. Chicago	1.75c
F.o.b. Gary	1.75c
F.o.b. Birmingham	1.75c
Del'd Philadelphia	1.85c
F.o.b. Coatesville	1.80c
F.o.b. Sparrows Point	1.80c
Del'd New York	1.98c
F.o.b. dock cars Pacific ports	2.25c
F.o.b. cars dock Gulf ports	2.10c
Wrought iron plates, f.o.b. P'gh	3.00c

Floor Plates

F.o.b. Pittsburgh	3.20c
F.o.b. Chicago	3.25c

Structural Shapes

Base per Lb.	
F.o.b. Pittsburgh mill	1.70c
F.o.b. Chicago	1.75c
F.o.b. Birmingham	1.85c
F.o.b. Buffalo	1.80c
F.o.b. Bethlehem	1.80c
Del'd Cleveland	1.85c
Del'd Philadelphia	1.90c
Del'd New York	1.95c
F.o.b. cars dock Gulf ports	2.10c
F.o.b. dock cars Pacific ports (standard)	2.25c
F.o.b. dock cars Pacific ports (wide flange)	2.35c

Steel Sheet Piling

Base per Lb.	
F.o.b. Pittsburgh	2.00c
F.o.b. Chicago mill	2.10c
F.o.b. Buffalo	2.10c
F.o.b. cars dock Gulf ports	2.45c
F.o.b. cars dock Pacific ports	2.45c

Alloy Steel Bars

Alloy	Differential per 100 lb.
2000 (1/2% Nickel)	0.25
2100 (2 1/2% Nickel)	0.55
2300 (3 1/2% Nickel)	1.50
2500 (5% Nickel)	2.25
3100 Nickel Chromium	0.55
3200 Nickel Chromium	1.35
3300 Nickel Chromium	3.80
3400 Nickel Chromium	3.20
4100 Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum) (1.50 to 2.00 Nickel)	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium)	0.35
6100 Chromium Steel (1.10 Chromium)	0.45
5100 Chromium Spring Steel	base
4100 Chromium Vanadium Bar	1.20
4100 Chromium Vanadium Spring Steel	0.95
Chromium Nickel Vanadium	1.50
Carbon Vanadium	0.95

Above prices are for hot-rolled steel bars. The differential for most grades in electric furnace steel is 50c. higher. The differential for cold-drawn bars is 1/4c. per

lb. higher with separate extras. Blooms, billets and slabs under 4x4 in. or equivalent are sold on the bar base. Slabs with a section area of 16 in. and 2 1/2 in. thick or over take the billet base. Sections 4x4 in. to 10x10 in. or equivalent carry a gross ton price, which is the net price for bars for the same analysis. Larger sizes carry extras.

Cold Finished Bars*

Base per Lb.	
Bars, f.o.b. Pittsburgh mill	2.10c
Bars, f.o.b. Chicago	2.15c
Bars, Cleveland	2.15c
Bars, Buffalo	2.30c
Bars, Detroit	2.30c
Bars, eastern Michigan	2.35c
Shafting, ground, f.o.b. mill	1 1/2 in. 3.40c
	1-3/16 to 1 1/2 in. 2.90c
	1-9/16 to 1 1/2 in. 2.75c
	1-5/16 to 2 1/2 in. 2.60c
	2-15/16 to 6 in. 2.45c

* In quantities of 10,000 to 19,000 lb.

SHEETS, STRIP, TIN PLATE TERNE PLATE

Sheets	Hot Rolled	Base per Lb.
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No. 10, f.o.b. Pittsburgh	1.75c
No. 10, f.o.b. Gary	1.85c
No. 10, del'd Detroit	1.95c
No. 10, del'd Phila.	2.04c
No. 10, f.o.b. Birmingham	1.90c
No. 10, f.o.b. dock cars Pacific ports	2.42 1/2c

Hot-Rolled Annealed

No. 24, f.o.b. Pittsburgh	2.25c
No. 24, f.o.b. Gary	2.35c
No. 24, del'd Detroit	2.45c
No. 24, del'd Phila.	2.44c
No. 24, f.o.b. Birmingham	2.40c
No. 24, f.o.b. dock cars Pacific ports	2.95c
No. 24, wrought iron, Pittsburgh	4.30c

Heavy Cold-Rolled

No. 10 gage, f.o.b. Pittsburgh	2.30c
No. 10 gage, f.o.b. Gary	2.40c
No. 10 gage, del'd Detroit	2.50c
No. 10 gage, del'd Phila.	2.59c
No. 10 gage, f.o.b. dock cars Pacific ports	3.00c

Light Cold-Rolled

No. 20 gage, f.o.b. Pittsburgh	2.75c
No. 20 gage, f.o.b. Gary	2.85c
No. 20 gage, del'd Detroit	2.95c
No. 20 gage, del'd Phila.	3.04c
No. 20 gage, f.o.b. dock cars Pacific ports	3.45c

Galvanized Sheets

No. 24, f.o.b. Pittsburgh	2.85c
No. 24, f.o.b. Gary	2.95c
No. 24, del'd Phila.	3.14c
No. 24, f.o.b. Birmingham	3.00c
No. 24, f.o.b. dock cars Pacific ports	3.55c
No. 24 Wrought iron, Pittsburgh	4.95c

Long Ternes

f.o.b. Pittsburgh	3.25c
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Vitreous Enameling Stock

No. 20, f.o.b. Pittsburgh	2.90c
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Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.65c
No. 28, Gary	2.75c

Tin Plate

Base per Box	
Standard cokes, f.o.b. P'gh district mill	\$5.25
Standard cokes, f.o.b. Gary	5.35
Standard cokes, f.o.b. cars dock Pacific ports	5.90

Terne Plate

(Per Package, 20 x 28 in.)	
8-lb. coating I.C.	\$10.00
15-lb. coating I.C.	12.00
20-lb. coating I.C.	13.00
25-lb. coating I.C.	14.00
30-lb. coating I.C.	15.25
40-lb. coating I.C.	17.50

Hot-Rolled Hoops, Bands, Strips and Flats under 1/4 in.

Base per Lb.	
All widths up to 24 in., P'gh	1.75c
All widths up to 24 in., Chicago	1.80c
All widths up to 24 in., del'd Detroit	1.95c
Cooperage stock, Pittsburgh	1.85c
Cooperage stock, Chicago	1.90c

Cold-Rolled Strips

F.o.b. Pittsburgh	2.40c
F.o.b. Cleveland	2.40c
Del'd Chicago	2.68c
F.o.b. Worcester	2.60c

Fender Stock

No. 20, Pittsburgh or Cleveland	3.10c
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WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Manufacturing Trade	Per Lb.
Bright wire	2.20c
Spring wire	3.20c

Extras of 10c. a 100 lb. on joint carloads and 30c. on pooled cars and less-than-carload lots are applied on all merchant wire products. An allowance of \$2 a ton is made to jobbers on straight, mixed or joint carloads; \$3 a ton is allowed on less-than-carload shipments.

Base per Keg	
Standard wire nails	\$2.35
Smooth coated nails	2.35
Galvanized nails:	
15 gage and coarser	4.35
16 gage and finer	4.85

Base per 100 Lb.	
Smooth annealed wire	\$2.35
Smooth galvanized wire	2.70
Polished staples	3.55
Galvanized staples	3.30
Barbed wire, galvanized	2.85
Woven wire fence, base column	60.00

Chicago and Anderson, Ind., mill prices are \$1 a ton over Pittsburgh base (on all products except woven wire fence, for which the Chicago price is \$2 above Pittsburgh); Duluth, Minn., and Worcester, Mass., mill prices are \$2 a ton over Pittsburgh (except for woven wire fence at Duluth which is \$3 over Pittsburgh), and Birmingham mill prices are \$3 a ton over Pittsburgh.

STEEL AND WROUGHT PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld			
Steel		Wrought Iron	
Inches	Black Galv.	Inches	Black Galv.
1/4	51 1/2 29 1/4	1/4	+91 1/2 +138
1/4 to 1/2	57 30 1/2	1/2 & 3/4	+11 1/2 +21 1/2
1/2	62 35 1/2	1/2	31 1/2 15
3/4	65 1/2 35 1/2	3/4	36 1/2 20 1/2
1 to 3	67 1/2 38 1/2	1 & 1 1/2	39 1/2 25 1/2
		1 1/2	43 1/2 28
		2	41 1/2 26

Wire Rods (Common soft, base)

	Per Gross Ton
Pittsburgh	\$36.00
Cleveland	36.00
Chicago	37.00
Birmingham	39.00
Youngstown (del'd)	37.00

ALLOY STEEL BLOOMS, BILLETS AND SLABS

F.o.b. Pittsburgh, Chicago, Buffalo, Massillon, Canton or Bethlehem. Base price, \$49 a gross ton except at Bethlehem, where it is \$51. Price del'd Detroit is \$52.

CARBON STEEL FORGING INGOTS

F.o.b. Pittsburgh, Youngstown or Chicago. Uncropped, \$28 per gross ton.

COKE, COAL AND FUEL OIL

Coke	Per Net Ton
Purnace, f.o.b. Connellsville	\$3.50
Foundry, f.o.b. Connellsville	\$4.25 to 5.25
Foundry, by-product, Chicago	8.50
Foundry, by-product, delivered in Chicago switching district	9.25
Foundry, by-product, New England, delivered	10.50
Foundry, by-product, Newark or Jersey City, del'd	8.20 to 8.81
Foundry, by-product, Philadelphia	9.00
Foundry, by-product, Cleveland delivered	9.27
Foundry, by-product, St. Louis	8.00
Foundry, by-product, del'd	9.00

Coal	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	\$1.55 to \$1.80
Mine run coking coal f.o.b. W. Pa. mines	2.00 to 2.00
Gas coal, 1/2-in. f.o.b. Pa. mines	1.80 to 2.30
Mine run gas coal, f.o.b. Pa. mines	1.80 to 2.20
Steam slack, f.o.b. W. Pa. mines	1.30 to 1.40
Gas slack, f.o.b. W. Pa. mines	1.65 to 1.85

Fuel Oil	Per Gal. f.o.b. Bayonne, N. J.
No. 3 distillate	4.00c.
No. 4 industrial	3.50c.
Per Gal. f.o.b. Baltimore	
No. 3 distillate	4.00c.
No. 4 industrial	3.50c.
Per Gal. del'd Chicago	
No. 3 industrial fuel oil	3.73c.
No. 5 industrial fuel oil	3.00c.
Per Gal. f.o.b. Cleveland	
No. 3 distillate	5.75c.
No. 4 industrial	5.50c.

REFRACTORIES	Per 1000 f.o.b. Works
Fire Clay Brick	
High-heat Intermediate Duty Brick	\$40.00
Duty Brick	40.00
Pennsylvania	45.00
Maryland	45.00
New Jersey	45.00
Ohio	45.00
Kentucky	45.00
Missouri	45.00
Illinois	45.00
Ground fire clay, per ton	7.00

Chrome Brick	Per Net Ton
Standard size	\$45.00

Silica Brick	Per 1000 f.o.b. Works
Pennsylvania	\$45.00
Chicago	54.00
Birmingham	55.00
Silica clay, per ton	8.00

Magnesite Brick	Per Net Ton
Standard sizes, burned, f.o.b. Baltimore and Chester, Pa.	\$65.00
Unburned, f.o.b. Baltimore	55.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Domestic, f.o.b. Chewelah, Wash.	22.00

CAST IRON PIPE	Per Net Ton
4-in. and larger, del'd	\$44.00 to \$45.00
4-in., del'd Chicago	47.00 to 48.00
4-in. and larger, del'd New York	43.00
4-in., del'd New York	46.00
4-in. and larger, Birmingham	36.00 to 37.00
4-in. Birmingham	39.00 to 40.00
Class "A" and gas pipe, \$3 extra.	

Pig Iron, Ores, Ferroalloys

PIG IRON

PRICES PER GROSS TON AT BASING POINTS

Basing Points	No. 2 Fdry.	Malleable	Basic	Bessemer
Everett, Mass.	\$18.50	\$19.00	\$18.50	\$19.50
Bethlehem, Pa.	18.50	19.00	18.00	19.50
Birdsboro, Pa.	18.50	19.00	18.00	19.50
Swedeland, Pa.	18.50	19.00	18.00	19.50
Sparrows Point, Md.	18.50	19.00	18.00	19.50
Neville Island, Pa.	18.00	18.00	17.00	18.50
Sharpsville, Pa.	17.50	17.50	17.00	18.00
Youngstown	17.50	17.50	17.00	18.00
Buffalo	17.50	18.00	16.50	18.50
Erie, Pa.	17.50	17.50	17.00	18.00
Cleveland	17.50	17.50	17.00	18.00
Toledo, Ohio	17.50	17.50	17.00	18.00
Detroit	17.50	17.50	17.00	18.00
Hamilton, Ohio	17.50	17.50	17.00	18.00
Chicago	17.50	17.50	17.00	18.00
Granite City, Ill.	17.50	18.00	17.00	18.00
Duluth, Minn.	18.00	18.00	18.50	19.00
Birmingham	13.50	12.50	12.50	13.50
Provo, Utah	16.50	16.50	16.50	17.50

DELIVERED PRICES PER GROSS TON AT CONSUMING CENTERS

	No. 2 Fdry.	Malleable	Basic	Bessemer
Boston Switching District	\$19.00	\$19.50	\$18.50	\$20.00
From Everett, Mass.	19.00	19.50	18.50	20.00
From Buffalo	20.77	21.27	20.27	21.77
From East. Pa. or Buffalo	19.89	20.39	19.39	20.89
Newark or Jersey City, N. J.	19.26	19.76	18.76	20.26
From East. Pa. or Buffalo	19.26	19.76	18.76	20.26
Philadelphia	19.26	19.76	18.76	20.26
From Eastern Pa.	18.51	18.51	18.01	19.01
Cincinnati	18.76	18.76	18.76	19.76
From Hamilton, Ohio	19.26	19.26	19.26	20.26
Canton, Ohio	19.26	19.26	19.26	20.26
From Cleveland and Youngstown	19.26	19.26	19.26	20.26
Columbus, Ohio	19.26	19.26	19.26	20.26
From Hamilton, Ohio	19.26	19.26	19.26	20.26
Mansfield, Ohio	19.26	19.26	19.26	20.26
From Cleveland and Toledo	19.26	19.26	19.26	20.26
Indianapolis	19.26	19.26	19.26	20.26
From Hamilton, Ohio	19.26	19.26	19.26	20.26
South Bend, Ind.	19.26	19.26	19.26	20.26
From Chicago	19.26	19.26	19.26	20.26
Milwaukee	19.26	19.26	19.26	20.26
From Chicago	19.26	19.26	19.26	20.26
St. Paul	19.26	19.26	19.26	20.26
From Duluth	19.26	19.26	19.26	20.26
Davenport, Iowa	19.26	19.26	19.26	20.26
From Chicago	19.26	19.26	19.26	20.26
Kansas City	19.26	19.26	19.26	20.26
From Granite City	19.26	19.26	19.26	20.26

Delivered prices on Southern iron for shipment to Northern points are 38c. a gross ton below delivered prices from the nearest Northern basing points.

LOW PHOSPHORUS PIG IRON

Basing points: Birdsboro, Pa., Steel-	\$23.00
ton, Pa., and Standish, N.Y.	23.00
Johnson City, Tenn.	23.00
Del'd Chicago	28.65

GRAY FORCE PIG IRON

Valley furnace	\$17.50
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CHARCOAL PIG IRON

Lake Superior furnace	\$20.50
Delivered Chicago	23.54
Delivered Buffalo	23.78

CANADA

Pig Iron

Per gross ton:	Delivered Toronto
No. 1 fdy., sil. 2.25 to 2.75	\$21.00
No. 2 fdy., sil. 1.75 to 2.75	20.50
Malleable	21.00
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75	\$22.50
No. 2 fdy., sil. 1.75 to 2.25	22.00
Malleable	22.50
Basic	22.00

Ferromanganese

Per Gross Ton	Domestic, 80%, seaboard, (carload)
	\$85.00
Per Gross Ton	Domestic, 80%, seaboard, (ton lots)
	92.00

Spiegeleisen

Per Gross Ton Furnace	Domestic, 19 to 21%
	\$27.00

Electric Ferrosilicon

Per Gross Ton Delivered	50% (carloads)
	\$77.50
Per Gross Ton	50% (ton lots)
	85.00
Per Gross Ton	75% (carloads)
	126.00
Per Gross Ton	75% (ton lots)
	136.00
Per Gross Ton	14% to 16% (f.o.b.) Welland
	31.00
Per Gross Ton	Ont. (in carloads) (duty paid)
	38.50
Per Gross Ton	14% to 16% (less carloads)
	38.50

Silvery Iron

Per Gross Ton	6%
	\$22.25
Per Gross Ton	7%
	23.25
Per Gross Ton	8%
	24.25
Per Gross Ton	9%
	25.25
Per Gross Ton	10%
	26.25
Per Gross Ton	11%
	27.25
Per Gross Ton	12%
	28.25
Per Gross Ton	13%
	29.25
Per Gross Ton	14%
	30.25
Per Gross Ton	15%
	31.25
Per Gross Ton	16%
	32.25
Per Gross Ton	17%
	33.25

Ferrovanadium, del., per lb. contained V.	\$2.70 to \$2.90
Ferrocobalt, 18 to 18% Ti, 6 to 8% C, f.o.b. furnace, carload and contract per net ton	\$137.50
Ferrophosphorus, electric, or blast furnace material, in carloads, 18%, Rockdale, Tenn. base, per gross ton with \$2 unitage	50.00
Ferrophosphorus, electric, 24% f.o.b. Anniston, Ala., per gross ton with \$2.75 unitage	65.00
Ferromolybdenum, per lb. Mo., del.	95c.
Calcium molybdate, per lb. Mo., del.	80c.
Silico spiegel, per ton, f.o.b. furnace, car lots	\$38.00
Ton lots or less, per ton	45.50
Silico-manganese, gross ton, delivered:	
2.50% carbon grade	90.00
2% carbon grade	95.00
1% carbon grade	105.00
Spot prices	\$5 a ton higher

Ores

Lake Superior Ores, Delivered Lower Lake Ports

Per Gross Ton	Old range, Bessemer, 51.5% iron
	\$4.80
Per Gross Ton	Old range, non-Bessemer, 51.50% iron
	4.65
Per Gross Ton	Mesabi Bessemer, 51.50% iron
	4.65
Per Gross Ton	Mesabi, non-Bessemer, 51.50% iron
	4.50
Per Gross Ton	High phosphorus, 51.50% iron
	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

Per Unit	Iron, low phos., copper free, 55 to 58% iron, dry Spanish or Algerian
	9.50c.
Per Unit	Iron, low phos., Swedish, average 68 1/2% iron
	9.50c.
Per Unit	Iron, basic or foundry, Swedish, average, 65% iron
	9c.
Per Unit	Iron, basic or foundry, Russian, average, 65% iron
	9c.
Per Unit	Manganese, Caucasian, washed 52%
	24c.
Per Unit	Manganese, African, Indian, 44-48%
	21c.
Per Unit	Manganese, African, Indian, 49-51%
	24c.
Per Unit	Manganese, Brazilian, 46 to 48 1/2%
	26c.

Per Net Ton Unit	Tungsten, Chinese wolframite, duty paid, delivered*
	\$15.00
Per Net Ton Unit	Tungsten, domestic scheelite, delivered
	\$14.50 to \$15.00

Per Gross Ton	Chrome, 45%, Cr2O3, crude, c.i.f. Atlantic Seaboard
	\$17.00
Per Gross Ton	Chrome, 48%, Cr2O3, c.i.f. Atlantic Seaboard
	20.00

*Quotations nominal in absence of sales.

Fluorspar

Per Net Ton	Domestic, washed gravel, 85-5 f.o.b. Kentucky and Illinois mines
	\$16.00
Per Net Ton	No. 2 lump, 85-5, f.o.b. Kentucky and Illinois mines
	16.00
Per Net Ton	Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid
	18.50
Per Net Ton	Domestic, No. 1 ground bulk, 85 to 98% calcium fluoride, not over 2 1/4% silicon, f.o.b. Illinois and Kentucky mines
	30.00

Iron and Steel Scrap

PITTSBURGH

Per gross ton delivered consumers' yards:	No. 1 heavy melting steel
	\$14.50 to \$15.00
Per gross ton delivered consumers' yards:	No. 2 heavy melting steel
	12.50 to 13.00
Per gross ton delivered consumers' yards:	No. 2 railroad wrought
	14.50 to 15.00
Per gross ton delivered consumers' yards:	Scrap rails
	14.50 to 15.00
Per gross ton delivered consumers' yards:	Rails 3 ft. and under
	15.00 to 16.00
Per gross ton delivered consumers' yards:	Sheet bar crops, ordinary
	16.00 to 16.50
Per gross ton delivered consumers' yards:	Compressed sheet steel
	14.25 to 14.75
Per gross ton delivered consumers' yards:	Hand bundled sheet steel
	12.50 to 13.00
Per gross ton delivered consumers' yards:	Hvy. steel axle turnings
	13.00 to 13.50
Per gross ton delivered consumers' yards:	Machine shop turnings
	10.50 to 11.00
Per gross ton delivered consumers' yards:	Short shop steel turnings
	10.50 to 11.00
Per gross ton delivered consumers' yards:	Short mixed borings and turnings
	8.00 to 8.50
Per gross ton delivered consumers' yards:	Cast iron borings
	8.00 to 8.50
Per gross ton delivered consumers' yards:	Cast iron car wheels
	13.00 to 13.50
Per gross ton delivered consumers' yards:	Heavy breakable cast
	12.00 to 12.50
Per gross ton delivered consumers' yards:	No. 1 cast
	15.00 to 15.50
Per gross ton delivered consumers' yards:	Rail. knuckles and couplers
	16.00 to 16.50
Per gross ton delivered consumers' yards:	Rail. coil and leaf springs
	16.00 to 16.50
Per gross ton delivered consumers' yards:	Roller steel wheels
	16.00 to 16.50
Per gross ton delivered consumers' yards:	Low phos. billet crops
	17.00 to 17.50
Per gross ton delivered consumers' yards:	Low phos. sheet bar crops
	16.50 to 17.00
Per gross ton delivered consumers' yards:	Low phos. plate scrap
	15.50 to 16.00
Per gross ton delivered consumers' yards:	Low phos. punchings
	16.00 to 16.50
Per gross ton delivered consumers' yards:	Steel car axles
	17.00 to 17.50

CHICAGO

Delivered Chicago district consumers:	Heavy melting steel
	\$11.50 to \$12.00
Delivered Chicago district consumers:	Shoveling steel
	11.50 to 12.00

Hydraulic comp. sheets	\$.10 00 to .10 50	10.00 to 10.50
Drop forge flashings	8.50 to 9.00	8.50 to 9.00
No. 1 busheling	10.00 to 10.50	10.00 to 10.50
Roller car wheels	12.00 to 12.50	12.00 to 12.50
Railroad tires	12.00 to 12.50	12.00 to 12.50
Railroad leaf springs	12.00 to 12.50	12.00 to 12.50
Axle turnings	9.00 to 9.50	9.00 to 9.50
Steel couplers and knuckles	12.00 to 12.50	12.00 to 12.50
Coil springs	12.50 to 13.00	12.50 to 13.00
Axle turnings (elec. fur.)	9.75 to 10.25	10.00 to 10.50
Low phos. punchings	12.50 to 13.00	12.50 to 13.00
Low phos. plates, 12 in. and under	12.50 to 13.00	12.50 to 13.00
Cast iron borings	6.75 to 7.25	6.75 to 7.25
Short shoveling turnings	6.75 to 7.25	6.75 to 7.25
Machine shop turnings	4.50 to 7.00	4.50 to 7.00
Rolling mill rails	12.00 to 12.50	12.00 to 12.50
Steel rails, less than 3 ft.	12.25 to 12.75	12.25 to 12.75
Steel rails, less than 2 ft.	12.75 to 13.25	12.75 to 13.25
Angle bars, steel	12.00 to 12.50	12.00 to 12.50
Cast iron car wheels	11.75 to 12.25	11.75 to 12.25
Railroad malleable	12.00 to 12.50	12.00 to 12.50
Agricultural malleable	10.00 to 10.50	10.00 to 10.50

No. 2 busheling	\$4.50 to \$5.00
Locomotive tires, smooth	9.50 to 10.00
Pipe and flues	5.50 to 6.00
No. 1 machinery cast	9.50 to 10.00
Clean automobile cast	9.00 to 9.50
No. 1 railroad cast	9.00 to 9.50
No. 1 agricultural cast	8.50 to 9.00
Stove plate	7.50 to 8.00
Grate bars	6.50 to 7.00
Brake shoes	8.50 to 9.00

PHILADELPHIA

Per gross ton delivered consumers' yards:	
No. 1 heavy melting steel	\$11.50 to \$12.00
No. 2 heavy melting steel	9.50
No. 1 railroad wrought	11.00
Rundled sheets	9.50
Hydraulic compressed, new	10.00
Hydraulic compressed, old	7.00 to 7.50
Machine shop turnings	7.50
Heavy axle turnings	10.00 to 10.50
Cast borings	5.50 to 6.00
Heavy breakable cast	11.50 to 12.00
Store plate (steel works)	9.50
No. 1 low phos. heavy	15.00 to 15.50
Couplers and knuckles	14.50 to 15.00
Roller steel wheels	14.50 to 15.00
No. 1 blast furnace	5.50 to 6.00
Spec. iron and steel pipe	10.00
Shafting	16.50
Steel axles	14.50
No. 1 forge fire	11.00
Cast iron car wheels	12.50 to 13.00
No. 1 cast	12.50 to 13.00
Cast borings (chem.)	12.00 to 14.00
Steel rails for rolling	13.00

CLEVELAND

Per gross ton delivered consumers' yards:	
No. 1 heavy melting steel	\$11.25 to \$11.75
No. 2 heavy melting steel	10.75 to 11.25
Compressed sheet steel	10.00 to 10.50
Light bundled sheet stamp-	
ing	6.50 to 7.00
Drop forge flashings	9.50 to 10.00
Machine shop turnings	8.75 to 9.25
Short shoveling turnings	8.75 to 9.25
No. 1 busheling	10.00 to 10.50
Steel axle turnings	9.00 to 9.50
Low phos. billet crops	12.50 to 13.00
Cast iron borings	8.75 to 9.25
Mixed borings and short	
turnings	8.75 to 9.25
No. 2 busheling	8.50 to 9.00
No. 1 cast	10.50 to 11.00
Railroad grate bars	6.50 to 7.00
Store plate	7.50 to 8.00
Rails under 3 ft.	14.00 to 14.50
Rails for rolling	14.00 to 14.50
Railroad malleable	11.75 to 12.00
Cast iron carwheels	11.00

BUFFALO

Per gross ton, f.o.b. Buffalo consumers' yards:	
No. 1 heavy melting steel	\$11.75 to \$12.25
No. 2 heavy melting steel	10.25 to 10.75
Scrap rails	11.50 to 12.00
New hydraulic comp. sheets	10.25 to 10.75
Old hydraulic comp. sheets	9.25 to 9.75
Drop forge flashings	10.25 to 10.75
No. 1 busheling	10.25 to 10.75
Hvy. steel axle turnings	9.50 to 10.00
Machine shop turnings	7.00 to 7.50
Knuckles and couplers	13.50 to 14.00
Cold and leaf springs	13.50 to 14.00
Roller steel wheels	13.50 to 14.00
Low phos. billet crops	14.00 to 14.50
Short shov. steel turnings	8.00 to 8.50
Short mixed borings and	
turnings	8.00 to 8.50
Cast iron borings	8.00 to 8.50
No. 2 busheling	7.50 to 8.00
Steel car axles	13.00 to 13.50
Iron axles	13.00 to 13.50
No. 1 machinery cast	12.50 to 13.00
No. 1 cupola cast	11.50 to 12.00
Stove plate	12.50 to 13.00
Steel rails, 3 ft. and under	13.00 to 14.00
Cast iron carwheels	12.00 to 12.50
Industrial malleable	12.00 to 12.50
Railroad malleable	12.50 to 13.50
Chemical borings	10.00 to 11.00

BIRMINGHAM

Per gross ton delivered consumers' yards:	
Heavy melting steel	\$10.00
Scrap steel rails	9.00
Short shoveling turnings	5.50
Store plate	\$7.00 to \$7.50
Steel axles	10.50 to 11.00
Iron axles	10.50 to 11.00
No. 1 railroad wrought	7.00
Rails for rolling	10.50
No. 1 cast	9.00 to 9.50
Tramcar wheels	9.00 to 9.50
Cast iron borings, chem.	8.00

ST. LOUIS

Per gross ton delivered consumers' yards:	
Selected heavy steel	\$10.50 to \$11.00
No. 1 heavy melting	9.25 to 9.75
No. 2 heavy melting	8.50 to 9.00
No. 1 locomotive tires	9.00 to 9.50
Mild stand-sec. rails	12.00 to 12.50
Railroad springs	11.50 to 12.00
Rundled sheets	6.00 to 6.50
No. 2 railroad wrought	9.25 to 9.75
No. 1 busheling	6.50 to 7.00
Cast iron borings and	
shoveling	5.25 to 5.75
Rails for rolling	12.00 to 12.50
Machine shop turnings	5.25 to 5.75
Heavy turnings	6.00 to 6.50
Steel car axles	11.25 to 11.75
Iron car axles	12.50 to 13.00
Wrot iron bars and trans.	9.75 to 10.25
No. 1 railroad wrought	6.75 to 7.25
Steel rails less than 3 ft.	12.50 to 13.00
Steel angle bars	11.50 to 12.00
Cast iron carwheels	9.00 to 9.50
No. 1 machinery cast	9.00 to 9.50
Railroad malleable	9.00 to 9.50
No. 1 railroad cast	8.50 to 9.00
Stove plate	6.50 to 7.00
Relay rails, 60 lb. and	
under	16.00 to 16.50

Relay rails, 60 lb. and	
over	\$20.00 to \$21.00
Agricult. malleable	9.00 to 9.50

BOSTON

Dealers' buying prices per gross ton:	
No. 1 heavy melting steel	\$7.50 to \$8.00
Scrap T rails	7.25 to 7.50
Machine shop turnings	4.00 to 4.50
Cast iron borings	4.00 to 4.25
Bundled skeleton	5.50 to 6.00
Forge flashings	5.25 to 5.75
Blast furnace scrap	2.75 to 3.00
Shafting	10.50 to 11.00
Steel car axles	10.00 to 10.50
Wrought pipe	4.75 to 5.00
Store plate	4.50 to 4.75
Cast iron borings, chemical	9.00 to 9.50
Per gross ton delivered consumers' yards:	
Textile cast	\$10.00 to \$10.50
No. 1 machinery cast	10.00 to 10.50
Railroad malleable	11.00 to 11.50

NEW YORK

Dealers' buying prices per gross ton:	
No. 1 heavy melting steel	\$9.00 to \$9.00
No. 2 heavy melting steel	7.00 to 7.50
Heavy breakable cast	7.50 to 8.00
No. 1 machinery cast	8.00 to 8.50
No. 2 cast	6.75 to 7.25
Stove plate	6.00
Steel car axles	10.50 to 10.75
No. 1 railroad wrought	7.50 to 8.00

PITTSBURGH

Base per Lb.	
Plates	3.05c.
Structural shapes	3.05c.
Soft steel bars and small shapes	2.85c.
Reinforcing steel bars	3.00c.
Cold-finished and screw stock:	
Rounds and hexagons	3.45c.
Squares and flats	3.45c.
Hoops and bands, under 1/4 in.	3.10c.
Hot-rolled annealed sheets (No. 24)	3.15c.
25 or more bundles	3.15c.
Galv. sheets (No. 24), 25 or more	3.70c.
bundles	3.70c.
Hot-rolled sheets (No. 10)	2.85c.
Galv. corrug. sheets (No. 28), per	
square (more than 3750 lb.)	\$3.32
Spikes, large	2.90c.
Track bolts, all sizes, per 100 count,	
65 per cent off list	
Machine bolts, 100 count,	
65 per cent off list	
Carriage bolts, 100 count,	
65 per cent off list	
Nuts, all styles, 100 count,	
65 per cent off list	
Large rivets, base per 100 lb.	\$3.25
Wire, black, soft ann'l'd, base per	
100 lb.	\$2.575c.
Wire, soft, base per 100 lb.	\$2.925c.
Common wire nails, per keg	\$2.557c.
Cement coated nails, per keg	\$2.557c.
On plates, structurals, bars, reinforcing	
bars, bands, hoops and blue annealed	
sheets, base applied to orders of 400 to	
9999 lb.	
*Delivered in Pittsburgh switching district.	

CHICAGO

Base per Lb.	
Plates and structural shapes	3.10c.
Soft steel bars	2.90c.
Cold-fn. steel bars and shafting	
Rounds and hexagons	3.40c.
Plates and squares	3.40c.
Bands, 3/16 in. (in Nos. 10 and	
12 gages)	3.20c.
Hoops (No. 14 gage and lighter)	3.20c.
Hot-rolled annealed sheets (No. 24)	3.70c.
Galv. sheets (No. 24)	4.30c.
Hot-rolled sheets (No. 10)	2.85c.
Spikes (9/16 in. and lighter)	3.50c.
Track bolts	4.65c.
Rivets, structural (keg lots)	3c.
Rivets, boiler (keg lots)	3.10c.
Per Cent Off List	
Machine bolts	60 and 5
Carriage bolts	60 and 5
Conch and lag screws	60 and 5
Hot-pressed nuts, sq., tap. or	
blank	60 and 5
Hot-pressed nuts, hex., tap. or	
blank	60 and 5
Hex. head and cap screws	80
Cup point set screws	70
Flat head bright wood screws, 3/4 and 10	
Spring cotters	50
Stove bolts in full packages	72 1/2
Rd. hd. tank rivets, 7/16 in. and	
smaller	65
Wrought washers	\$5.50 off list
No. 8 black ann'l'd wire per 100 lb.	\$3.75
Com. wire nails, base per keg	2.70c.
Cement c'd nails, base per keg	2.70c.

NEW YORK

Base per Lb.	
Plates	3.30c.
Structural shapes	3.27c.
Soft steel bars, small shapes	3.17c.
Iron bars	3.24c.
Iron bars, swed. charcoal	7.00c.
Cold-fn. shafting and screw stock:	
Rounds and hexagons	3.92c.
Flats and squares	4.42c.
Hot-roll. strip, soft and quarter	
hard	4.00c.
Hoops	3.42c.
Bands	3.42c.
Hot-rolled sheets (No. 10)	3.17c.
Hot-rolled ann'l'd sheets (No. 24)	3.65c.
Galvanized sheets (No. 2)	4.25c.
Long term sheets (No. 24)	5.90c.
Standard tool steel	12.00c.
Wire, black annealed (No. 10)	3.30c.
Wire, galv. annealed (No. 10)	4.05c.

No. 1 yard wrought, long	\$6.50 to \$7.00
Spec. iron and steel pipe	5.75 to 6.00
Forge fire	5.50 to 6.00
Rails for rerolling	9.00 to 9.25
Short shoveling turnings	3.00 to 3.50
Machine shop turnings	3.50 to 3.75
Cast borings	4.50 to 4.75
No. 1 blast furnace	2.50 to 3.00
Cast borings (chemical)	11.00 to 11.50
Unprepared yard iron and	
steel	5.00 to 5.25
Per gross ton, delivered local foundries:	
No. 1 machinery cast	\$11.00
No. 1 hvy. cast (cupola	
size)	10.00
No. 2 cast	9.00

CINCINNATI

Dealers' buying prices per gross ton:	
Heavy melting steel	\$8.25 to \$9.00
Scrap rails for melting	9.00 to 9.50
Loose sheet clippings	4.75 to 5.25
Bundled sheets	6.00 to 6.50
Cast iron borings	6.00 to 6.50
Machine shop turnings	5.50 to 6.00
No. 1 busheling	6.50 to 7.00
No. 2 busheling	3.50 to 4.00
Rails for rolling	9.50 to 10.00
No. 1 locomotive tires	9.00 to 9.50
Short rails	11.75 to 12.25
Cast iron carwheels	8.25 to 8.75
No. 1 machinery cast	9.50 to 10.00
No. 1 railroad cast	9.00 to 9.50
Burnt cast	6.50 to 7.00
Stove plate	6.50 to 7.00
Agricultural malleable	8.50 to 9.00
Railroad malleable	9.00 to 9.50

Tire steel 1/4 x 1/4 in. and larger	3.50c.
Smooth finish, 1 to 2 1/4 x 1/4 in.	
and larger	3.75c.
Open hearth spring steel, bases	
4.00c. to 10.00c.	
Common wire nails, base, per keg	\$3.00
Per Cent Off List	
Machine bolt, cut thread:	
1/4 x 6 in. and smaller	60
1/4 x 30 in. and smaller	60
Carriage bolts, cut thread:	
1/4 x 6 in. and smaller	60
1/4 x 20 in. and smaller	50
Boiler tubes:	
Lap welded, 2-in.	\$18.05
Seamless welded, 2-in.	19.24
Charcoal iron, 2-in.	24.94
Charcoal iron, 4-in.	65.65

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

ST LOUIS

Base per Lb.	
Plates and struc. shapes	3.34c.
Bars, soft steel or iron	3.14c.
Cold-fn. rounds, shafting, screw	
stock	2.74c.
Hot-rolled annealed sheets (No. 24)	3.94c.
Galv. sheets (No. 24)	4.54c.
Hot-rolled sheets (No. 10)	3.19c.
Black corrug. sheets (No. 24)	3.99c.
Galv. corrug. sheets	4.59c.
Structural rivets	3.59c.
Boiler rivets	3.69c.
Per Cent Off List	
Tank rivets, 7/16 in. and smaller	60
Machine and carriage bolts, lag screws,	
fitting up bolts, bolt ends, clew bolts,	
hot-pressed nuts, square and hexagon,	
tapped or blank, semi-finished nuts	
1000 lb. or over	60
200 to 999 lb.	55 and 5
100 to 199 lb.	50 and 5
Less than 100 lb.	50
*No. 26 and lighter take special prices.	

PHILADELPHIA

Base per Lb.	
*Plates, 1/4-in. and heavier	2.75c.
*Structural shapes	2.75c.
*Soft steel bars, small shapes, iron	
bars (except bands)	2.75c.
*Reinforc. steel bars, sq. twisted	
and deformed	2.505c.
Cold-finished steel bars	3.73c.
*Steel hoops	3.30c.
*Steel bands, No. 12 to 3/16 in.	
incl.	3.05c.
Spring steel	5.00c.
*Hot-rolled annealed sheets (No. 24)	3.40c.
*Galvanized sheets (No. 24)	4.00c.
*Hot-rolled annealed sheets (No.	
10)	2.95c.
Diam. pat. floor plates, 1/4 in.	4.75c.
Swedish iron bars	6.25c.

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.
*Base prices subject to deduction on orders aggregating 4000 lb. or over.
†For 5 tons or more, exclusive of cutting charge.

CLEVELAND

Base per Lb.	
Plates and struc. shapes	3.21c.
Soft steel bars	2.90c.
Reinforc. steel bars	2.00c. to 2.50c.
Cold-finished steel bars	3.40c.
Flat rolled steel under 1/4 in.	3.26c.
Cold-finished strip	5.50c.
Hot-rolled annealed sheets (No. 24)	3.76c.
Galvanized sheets (No. 24)	4.36c.
Hot-rolled sheets (No. 10)	3.01c.
Black ann'l'd wire, per 100 lb.	\$2.45
No. 9 galv. wire, per 100 lb.	2.80
Com. wire nails, base per keg	2.45

CINCINNATI

Base per Lb.	
Plates and struc. shapes	3.30c.
Bars, soft steel or iron	3.10c.

DETROIT

Dealers' buying prices per gross ton:	
Heavy melting steel	\$9.75 to \$10.25
Borings and short turnings	7.50 to 8.00
Long turnings	6.50 to 7.00
No. 1 machinery cast	10.50 to 11.00
Automotive cast	11.75 to 12.25
Hydraulic comp. sheets	10.00 to 10.50
Stove plate	7.50 to 8.00
New factory busheling	8.75 to 9.25
Old No. 2 busheling	6.25 to 6.75
Sheet clippings	7.00 to 7.50
Flashings	8.50 to 9.00
Low phos. plate scrap	10.50 to 11.00

CANADA

Dealers' buying prices per gross ton:	
Toronto Montreal	
Heavy melting steel	\$5.50 \$5.00
Rails, scrap	6.00 4.00
Machine shop turnings	2.50 2.00
Boiler plate	4.50 4.00
Heavy axle turnings	2.50 2.00
Cast borings	3.00 2.50
Steel borings	2.00 1.50
Wrought pipe	2.50 2.00
Steel axles	4.50 4.00
Axles, wrought iron	4.50 4.00
No. 1 machinery cast	7

Fabricated Structural Steel

Awards in Small Volume—New Projects Also Decline

LETTINGS of 6700 tons are the smallest to date this year and compare with 14,925 tons in the previous week. The largest awards were 1140 tons for a State bridge at Treichlers, Pa., and 1080 tons for the Calvert Street bridge in Washington. New projects of 7200 tons compare with 10,825 tons last week and 22,245 tons two weeks ago. With the exception of 1000 tons for bridges in Nebraska, no new sizable jobs were reported. Lettings in February totaled 55,225 tons, compared with 60,890 tons in January and 79,925 tons in December. Structural steel awards for the week follow:

FABRICATED AWARDS

NORTH ATLANTIC STATES

Wellsville, N. Y., 105 tons, Sinclair Refining Co. buildings, to Lackawanna Steel Construction Corp.

Clearfield County, Pa., 120 tons, highway bridge, to Lackawanna Steel Construction Corp.

Bridgeville, Pa., 100 tons, factory addition for Belden Mfg. Co., to Guibert Steel Co.

Ocean Port, N. J., 270 tons, Government laboratory, to Belmont Iron Works.

Treichlers, Pa., 1140 tons, State highway bridge, to McClintic-Marshall Corp.

Aberdeen, Md., 240 tons, Government hangar, to McClintic-Marshall Corp.

State of Maryland, 300 tons, Octoraro Creek bridge, to Fort Pitt Bridge Works Co.

Baltimore, 270 tons, 5th Regiment Armory, to Dietrich Brothers.

Washington, 1080 tons, Calvert Street bridge, to Mount Vernon Bridge Co.

THE SOUTH

Shelby County, Tenn., 490 tons, highway bridge, to Virginia Bridge & Iron Co.

Williamsburg, Va., 200 tons, two bridges for Chesapeake & Ohio Railroad, to Dietrich Brothers.

Coal Creek, Tenn., 170 tons, coal cleaning plant for Tennessee Valley Authority, to Ingalls Iron Works Co.

CENTRAL STATES

Decatur, Ill., 220 tons, State highway bridge, to McClintic-Marshall Corp.

Dayton, Ohio, 340 tons, static testing laboratory, to Fort Pitt Bridge Works Co.

Cleveland, 180 tons, sheet steel piling for Pennsylvania Railroad; Drury Construction Co. general contractor.

Sioux City, Iowa, 230 tons, beam spans, to American Bridge Co.

Winona, Minn., 110 tons, post office, to Lake-side Bridge Co.

Angus, Neb., 210 tons, State highway bridge, to Omaha Steel Works.

WESTERN STATES

Jolama, Cal., 125 tons, viaduct for Southern Pacific Railroad, to American Bridge Co.

Winston, Ore., 410 tons, highway bridge, to Poole & McGonigle.

Monte Rio, Cal., 400 tons, Russian River bridge, to Judson-Pacific Co.

Seattle, 1100 tons of sheet piling for seawall, to Pacific Coast Steel Corp., Columbia Steel Co. and A. M. Castle & Co.

Everett, Wash., 150 tons, County bridge, to Wallace Bridge & Structural Steel Co.

Government Island, Cal., 3300 tons of sheet piling for Coast Guard bulkhead; bids March 1.

NEW STRUCTURAL STEEL PROJECTS

NORTH ATLANTIC STATES

New York, 12,300 tons, post office annex; James Stewart & Co., Inc., general contractor. Subletting expected within the next week.

New York, 5000 tons, Thirty-eighth Street tunnel, Mason & Hanger Co., Inc., general contractor; subletting expected in three weeks.

Schenectady, N. Y., 350 tons, County court-house.

Richmond Hill, N. Y., 270 tons, State highway bridge.

Burlington County, N. J., 450 tons, bridge; bids March 2.

Elizabeth, N. J., 250 tons, State highway bridge; bids March 12.

Newport, Pa., 800 tons, State highway bridge; bids March 9.

Harrisburg, Pa., 300 tons, channel bars for highway sign posts for Department of Property and Supplies; bids March 5.

Camden, N. J., 400 tons, bridges for Pennsylvania Railroad.

Wheatland, Pa., 150 tons, State highway bridge.

Baltimore, 250 tons, building No. 2 for American Zirconium Corp.

Washington, 400 tons, Woodrow Wilson High School.

THE SOUTH

Logan, W. Va., 700 tons, bridge.

Ronceverte, W. Va., 150 tons, bridge for Chesapeake & Ohio Railroad.

CENTRAL STATES

Traverse City, Mich., 275 tons, improvements to park.

Toledo, 200 tons, Naval Reserve Armory; bids taken Feb. 28.

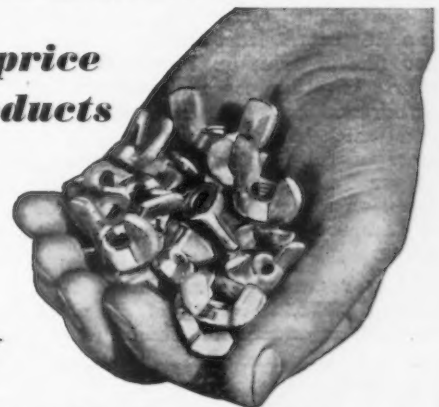
Dayton, Ohio, 400 tons, technical data building for War Department at Wright Field.

Chicago, 150 tons, store building for Becker-Ryan & Co.

State of Illinois, 260 tons, bridges at Benton and De Soto.

COMPARE *Cold-forged* Wing Nuts and Thumb Screws

—for quality and price
with ordinary products



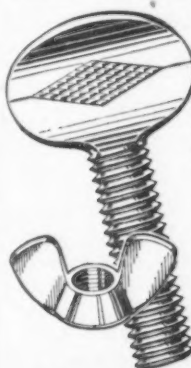
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Company

Address

St. Louis Park, Minn., 230 tons, State highway bridge.

Milwaukee, 175 tons, sewage treating plant.

State of Nebraska, 1000 tons, highway bridges.

FABRICATED PLATE AWARDS

Spartansburg, Md., 505 tons, water tanks, to R. D. Cole Mfg. Co.

Crownsville, Md., 115 tons, water tank, to Pittsburgh-Des Moines Steel Co.

NEW PROJECTS

Rome, N. Y., 600 tons, gas holder.

New York, 1700 tons, Thirty-eighth Street tunnel, Mason & Hanger Co., Inc., general contractor; subletting expected in three weeks.

This Week on the Assembly Line

(Concluded from Page 50)

Announcement by the Steel Institute that official recognition has been given to hot-rolled pickled and deoxidized sheets, otherwise known as Ford steel, at 2.65c., Pittsburgh, should not be interpreted as meaning that this grade has not been sold to the Ford Motor Co. in the last six months or that prices on it had not been filed and given official sanction by the Code Authority many weeks ago. It was pointed out in this column on Jan. 18 that at least three steel mills had filed a price on Ford steel and efforts of other companies to secure withdrawal from the market of this item which has been used by Ford in place of full-finished sheets were of no avail. Apparently what has been going on for some time in the trade is just now getting its first public airing.

It is regarded as significant that most of \$275,000 worth of die work which it is understood Buick has let

for its small car went to shops outside Detroit. It will be recalled that automobile makers sent their work outside Michigan during the recent tool and die strike, but it was thought that after the strike ended much of the work in the future would revert to local shops. The story is going the rounds that a Packard Hupmobile merger may eventuate this year, thereby strengthening the dealer organizations of both companies.

A spokesman for General Motors Corp. is authority for the statement today that "The corporation positively is not conducting negotiations to purchase any steel company just now." From the fact that emphasis apparently was placed on the two words "just now" it appears that General Motors has not completely dismissed the idea of acquiring its own source of steel despite recent abandonment of discussions looking toward an alliance with or purchase of the Corrigan McKinney Steel Co., together with its subsidiary, the Newton Steel Co.

G. M. Wages On 1929 Level

IF the current demand keeps up, automobile workers will end 1934 with approximately the same total earnings for the year as in 1929, predicted William S. Knudsen, executive vice-president of General Motors Corp., in an address before the Industrial Executives Club of Flint Feb. 26. Mr. Knudsen declared that "hourly wages of General Motors today are practically what they were in 1929 and if we manage to take the average maximum number of hours of work permitted to us

under the code we will have about the same number of hours of average as we had in 1929." He added that it is reasonably sure that we can meet the 40-hr. average until Sept. 5, the end of the current code year. "We have a demand for motor cars exceeding about 60 days' production which is a better demand than we have had since 1929." He disclosed that the average hourly wage in General Motors is about 60 per cent in excess of the minimum which is 43c. Only about one per cent are earning as little as the minimum.

Considerable Tonnage Pending on Coast

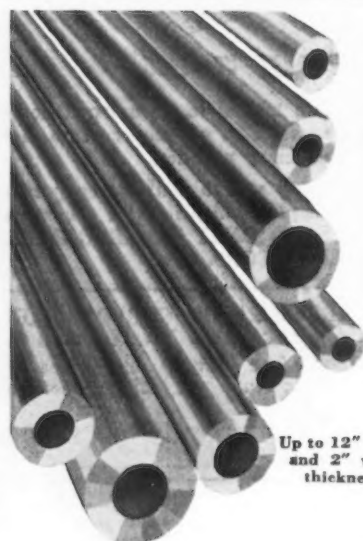
SAN FRANCISCO, Feb. 27.—Large steel tonnages to be placed soon include 2300 tons of bars for a side dam at Bonneville, Ore.; 1000 tons of bars for a Navy causeway at Mare Island, Cal.; 3150 tons of bars at Denver for Boulder Dam; 560 tons of bars for Oakland County, Cal., bridge; 2245 tons of bars for various jobs in southern California; and 3500 to 4500 tons of shapes for radio towers at Pearl Harbor, T. H., and Summit, C. Z.

Some of the mathematics of plastic deformation in deep drawing were developed by Dr. M. H. Sommer, consulting metallurgical engineer, New York, in a paper presented to the annual meeting of the American Institute of Mining and Metallurgical Engineers. In the monograph, Dr. Sommer stresses what he terms the actual stress-strain curve (a curve taking into account the stresses of the gradually reduced cross-section of the piece under test), and proceeds to establish an intimate relation between the actual stress-strain findings and the deep-stamping properties of metals.

Twelve hundred employees of Nash Motors Co., Racine, Wis., have gone on strike, demanding a 20 per cent increase in wages. The strike has tied up output of the company's newly introduced LaFayette car, on which production was just being started on a volume basis.

Horace T. Potts Co., E. Erie Avenue & D St., Philadelphia, has been appointed Philadelphia distributor of wire rope for Macwhyte Co., Kenosha, Wis. John W. Taylor, of the Macwhyte Co. will be resident engineer associated with the distributor to advise on technical requirements.

The operating rate of the steel industry for the week beginning Feb. 26 was 45.7 per cent as compared with 43.6 per cent last week, according to the American Iron and Steel Institute.



Up to 12" O.D.
and 2" wall
thickness

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NON-SHRINK
OIL HARDENING
NON-DEFORMING

for RING DIES
CUTTING DIES
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Manufacturers of BISCO Tungsten Carbide and
Tantalum Carbide drawing dies for wire, rod and tubing.

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945 E. 67th ST.

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CLEVELAND, OHIO

Buffalo

Trend of Steel Output Still Upward in Valley District

YOUNGSTOWN, Feb. 27.—With the month drawing to a close, Valley steel producers are able to report gains ranging from 50 to 100 per cent in their business as compared with January. Considering the reduced number of working days and the rather modest expectations of a few weeks ago, the record is even more remarkable. Steel production in the district during the month averaged between 45 and 50 per cent of capacity, and with the new month beginning with an ingot engagement of 55 per cent, the March average will certainly be 10 to 15 points higher. In fact, leading producers already have sufficient sheets, strip and tin plate business on their books to assure continuance of the current production rate through March.

While automotive business is naturally the outstanding feature of the local market, mills are well satisfied with the gradual increase in the requirements of other consuming groups. Electric refrigerator makers are specifying much more freely than they were earlier in the year and a steadily improving demand for makers of steel barrels is reported. Stove makers are more active and stamping plants served by the Valleys are increasing their needs for a wide range of products. An important steel tank fabricator has stepped up production as a result of business from the oil industry. Large fabricators of steel building products and office furniture in the district have nearly worked off large stocks accumulated in the last quarter of 1933 and are expected to buy heavily for the second quarter.

The pipe business remains comparatively quiet, with oil country goods leading in demand. Standard pipe is rather dull, as is material for oil and gas-carrying lines, although it is pointed out that a number of fair-sized pipe lines are in prospect which might be bought if financial arrangements could be made.

The only depressing news of the past week was the filing of a price of 1.70c., Pittsburgh, on hot-rolled strip by one large producer. While this price restored the old differential on hot strip at Pittsburgh and Chicago, Valley producers had not intended to make this adjustment and have not met the new filing. It is understood here that the lower price can be withdrawn during the 10-day period which must elapse before it becomes effective and such action would not be surprising. A lower price on hot-rolled, pickled in the breakdown, annealed, deoxidized sheets was also filed last week, the reduction amounting to \$2 a ton at Pittsburgh and Gary, Ind. While this product is used

only by one large automobile maker, and is thus not widely quoted, its relationship with other grades of sheets is important. The new set-up places the pickled in the breakdown product at a \$4 a ton differential under light cold-rolled sheets, as compared with \$2 a ton heretofore. With the larger differential it might naturally be of more interest to other automobile makers. As in the case of hot-rolled strip, the new price has not been filed by other makers and might be withdrawn by the mill which originally made the reduction.

Recent price filings on the above products, as well as on stainless steel, cold-finished steel bars and pig iron, have served to convince the trade that open competition has not been stifled by the industry's code. It had been predicted that individual companies would not likely file prices which were not immediately followed by other makers, but a half-year's operation of the code has made it quite evident that low-cost producers are not willing to give up the advantages which they have in certain competitive markets.

On March 1 Valley steel makers will begin to solicit second-quarter business at current prices. With the prospect of an advance in both sheet and strip prices before the new quarter is very far along, it is likely that consumers will be anxious to cover their requirements. Semi-finished

steel is also expected to be advanced, although such an increase would not likely be made prior to an upward adjustment in finished steel prices.

Demand for pig iron continues quiet. A steelworks blast furnace will be blown in this week, and a merchant stack has already resumed. Scrap continues strong, although no large transactions have been reported.

Storms Hamper Boston Scrap Movement

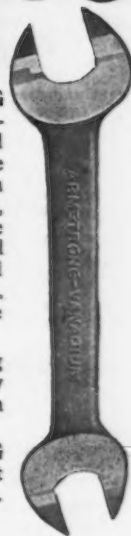
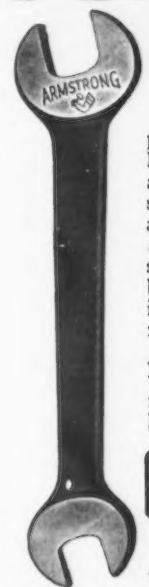
BOSTON, Feb. 27.—Furnace representatives report there will be no change in the price of pig iron March 1. It was previously intimated an advance might be made. Buying of pig iron has been limited to carlots in most instances, the aggregate for the past week being inconsequential.

Snow and ice have greatly hindered the movement of scrap throughout New England. As a result, brokers' activity has been lessened. However, sales of No. 1 heavy melting steel for Pittsburgh delivery were made the past week at \$8 a ton, on cars shipping point, up 25c. from the previous week, and at least one sale of steel turnings is reported at \$4.50 a ton, an advance of 50c. from the previous top price. Otherwise scrap prices are firm and unchanged.

New cast iron pipe business has dropped to a minimum, and because of storms former purchasers are deferring shipping instructions. Business in fabricated structural steel and reinforcing steel bars the past fortnight was almost at the zero point.

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ARMSTRONG-VANADIUM Wrenches are finding wide use on automatic screw machines and assembly floors where their light weight, great strength and thin heads prove a decided advantage.



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PLANT EXPANSION AND EQUIPMENT BUYING

Machine Tool Inquiry in Heaviest Volume in Four Years

INQUIRIES for machine tools have been accumulating in steady volume for several weeks and are now estimated by some builders as being in the heaviest volume in four years. Aside from business emanating from automobile manufactures pending orders are from a wide diversity of industries and usually call for single machines. Actual purchases to date have been below expectations, but it is believed that many orders are being delayed pending the award of Governmental projects.

Machine tool repair business has shown a particularly large gain of late, being more active than at any time since 1930. This indicates that as shops get busier their first step is to try to put old machines into com-

mission, preferring to await more sustained improvement in their activity before purchasing new equipment.

Chevrolet, which bought milling machines for its Toledo transmission plant a week ago, is reported to have purchased broaching machines and turning lathes for the same delivery. Dodge Brothers, which were expected to make large purchases of machine tools, have halted negotiations because of inability to obtain the deliveries desired. The equipment was wanted for March and April production.

Demand for milling and grinding equipment has been outstanding at Cincinnati, where makers of such tools are operating at 50 per cent of capacity.

◀ NEW ENGLAND ▶

Board of Education, Laconia, N. H., has plans for new multi-story practical arts school. Cost \$164,000 with equipment. Federal financing is being arranged. Norman P. Randlett, 211 Main Street, Laconia, and 192 Boylston Street, Boston, is architect and engineer.

Andrew-Myerson Corp., Boston, has been organized by Henry P. Caddy and Joseph Myerson, 411 Atlantic Avenue, to manufacture tools and mechanical equipment.

Alfred Brown Associates, Inc., Harding and Cherry Streets, Worcester, Mass., manufacturer of machine parts and equipment, plans rebuilding part of four-story plant recently destroyed by fire. Loss close to \$50,000 with equipment.

Board of Selectmen, Ipswich, Mass., plans manual training department in new multi-story high school. Cost over \$175,000. J. William Beal Sons, 185 Devonshire Street, Boston, are architects.

Clinton Machine Works, 460-64 High Street, Clinton, Mass., plans rebuilding part of plant recently damaged by fire. Loss over \$25,000 with equipment. Construction will be carried out by Clinton Gas Co., 212 High Street, which owns building.

◀ NORTH ATLANTIC ▶

Tilo Roofing Co., 370 Lexington Avenue, New York, manufacturer of roofing products, has acquired plant of Spring Perch Co., Boston Post Road, Bridgeport, Conn., totaling 65,000 sq. ft. floor space on six-acre tract, and will remodel for new works.

Anchor Cap & Closure Corp., 22 Queens Street, Long Island City, New York, manufacturer of metal bottle caps, bottle-sealing equipment, etc., plans early installation of equipment in new plant unit at Toronto, Ont., totaling 20,000 sq. ft. floor space, now nearing completion, operated in name of Anchor Cap & Closure Corp. of Canada, Ltd. Cost over \$35,000 with machinery.

A. Ward Hendrickson & Co., Inc., Brooklyn, has been organized by Arthur W. Hendrickson, 178th Street and Dalny Road, Jamaica, L. I., and Thomas A. Heffernan, 116-35 155th Street, Jamaica, to manufacture ornamental iron products.

machinery, automatic control equipment at Watchung and Grove Street stations, and new tank unit at latter plant. Cost about \$125,000. Otto A. Feth is water superintendent.

Board of County Freeholders, Court House, Camden, N. J., has plans for new power plant at County hospital, Lakeland. Cost about \$300,000 with equipment. Green & MacNelly, Camden, are architects. H. Berkeley Hackett, Architects' Building, Philadelphia, is consulting engineer.

Board of Education, Westfield, N. J., plans manual training equipment in new multi-story school. Cost \$275,000 with equipment. Financing has been arranged through Federal aid. Coffin & Coffin, 522 Fifth Avenue, New York, are architects.

Delaware School Foundation, duPont Building, Wilmington, Del., plans manual training department in addition to school at Claymont, Del., for which fund of \$115,000 has been secured. Walter Carlson, duPont Building, is architect.

Register & Grille Mfg. Co., Inc., 70 Berry Street, Brooklyn, has been organized with James H. Bailey, president; Frank T. Bailey, vice-president; Clifford D. Bailey, secretary and Alfred Tuttle, treasurer. Company is equipped to supply register and grille requirements of standard and special design.

◀ BUFFALO DISTRICT ▶

City Council, Niagara Falls, N. Y., W. D. Robbins, city manager, plans extensions and improvements in municipal waterworks plant, including two new pumping units, each with capacity of about 12,000,000 gal. a day, and auxiliary equipment, power and heating equipment at filtration station, pipe lines, etc. Cost \$445,000. Fund has been secured through Federal aid.

Cohoes Rolling Mill Co., Cohoes, N. Y., plans rebuilding part of coupling and nipple manufacturing plant recently destroyed by fire. Loss over \$45,000 with equipment.

Hollinger Consolidated Gold Mines, Ltd., Timmins, Ont., plans extensions and improvements at gold-mining properties, including installation of drilling, elevating, conveying and other equipment. Cost over \$500,000 with machinery.

◀ OHIO AND INDIANA ▶

Lynchburg Distillery Co., Lynchburg, Ohio, care of Carl J. Kiefer, Schmidt Building, Cincinnati, consulting engineer, has plans for extensions and improvements in former local distillery, recently acquired, including new one-story bottling works, storage and distributing buildings, tank house, boiler house and other units. List of equipment is being completed. Cost about \$300,000 with machinery. B. M. Markstein is president.

Winton Engine Co., 2160 West 106th Street, Cleveland, manufacturer of Diesel engines and parts, has let general contract to Austin Co., Cleveland, for one-story addition, 65 x 210 ft. Cost about \$70,000 with equipment. Company is a subsidiary of General Motors Corp.

Peerless Stove & Mfg. Co., Columbus, Ohio, has been organized by Dwight A. Swisher and C. L. Beverly, Columbus, to manufacture stoves, ranges and parts. Company will take over local plant and organization of same name.

Contracting Officer, Material Division, Wright Field, Dayton, Ohio, asks bids until March 6 for one motor-driven universal grinder (Circular 283).

Board of Education, Sabina, Ohio, has authorized installation of manual training department in two-story addition to high and grade school, for which bids will be asked at once on general contract. E. W. Austin, 19 South High Street, Columbus, Ohio, is architect.

Department of Public Utilities, City Hall, Cleveland, William J. Rogers, director, has plans for new power house and blower plant at sewage disposal works. Cost about \$300,000 with equipment. George B. Gascoigne & Co., Leader Building, are consulting engineers.

Willys-Overland Co., Toledo, Ohio, in receivership, will soon resume operations at

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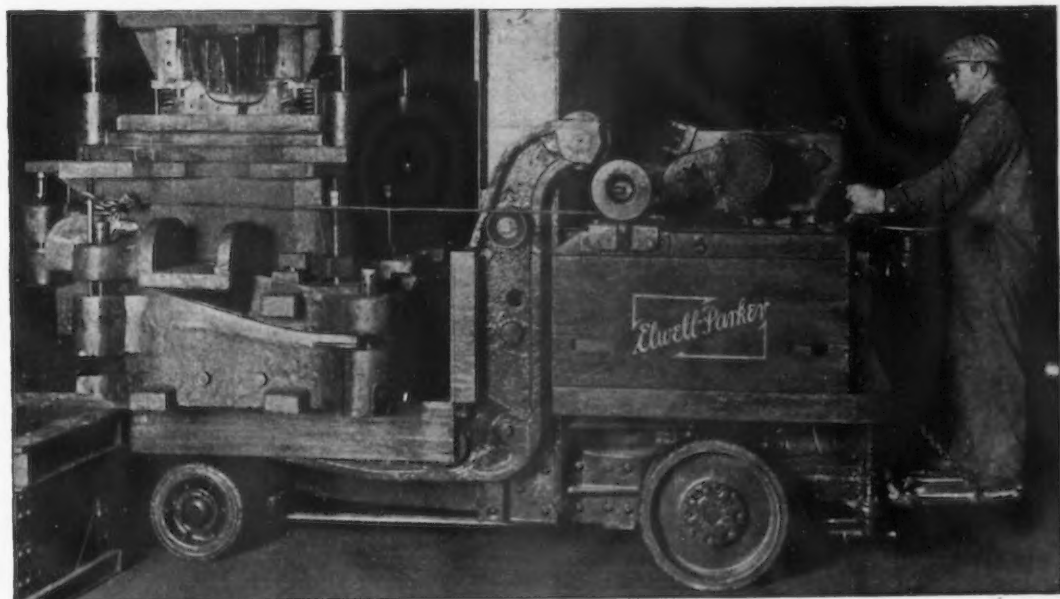


Positive plate of an Exide-Ironclad Battery, showing the exclusive slotted rubber tube construction which assures tremendous power and long life.



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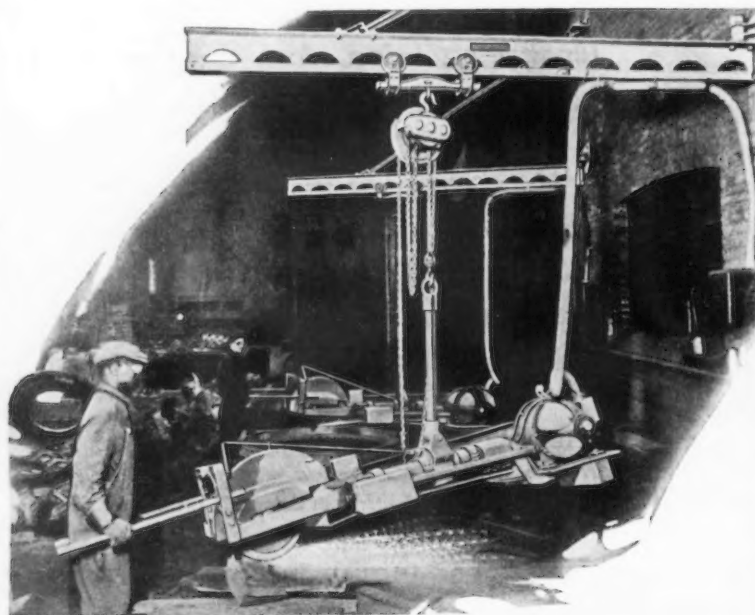
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main plant, following shut-down for several months, for production of automobiles and motor trucks. Subsidiary plants of Willys-Morrow Co., Elmira, N. Y., and Wilson Foundry & Machine Co., Pontiac, Mich., similarly closed, will also be reopened.

Merchants Distilling Co., Terre Haute, Ind., has plans for new distilling plant. Cost over \$150,000 with equipment. C. Walter Wagner, Louisville, is architect.

Kroghman Distilling Co., Tell City, Ind., has asked bids on new three-story plant. List of equipment is being arranged. Cost over \$100,000 with machinery.

Joseph E. Seagram & Sons, Inc., Lawrenceburg, Ind., recently organized as a subsidiary of Distillers Corp.-Seagrams, Ltd., Montreal, has plans for extensions and improvements in former local plant of Rossville Union Distilleries, Inc., lately acquired, including equipment. Cost about \$200,000 with machinery. Plans have been approved for 10-story storage and distributing plant, 150 x 250 ft. Cost \$300,000 with mechanical-handling and other equipment.

◀ SOUTH ATLANTIC ▶

Southern States Paper & Mfg. Co., Leesburg, Fla., recently organized by P. B. Alsbrook, Leesburg, and associates, has acquired former mill of Leesburg Grass Fibre, Pulp & Paper Co., and will remodel for new plant. Company will also develop raw material properties. Cost over \$75,000 with machinery.

C. P. Southerland, P. O. Box 4, Charlotte, N. C., is at head of project to establish plant for manufacture of metal products, including screens, frames and kindred specialties.

Town Council, Blackville, S. C., plans installation of pumping machinery and auxiliary equipment, pipe lines, etc., for new municipal water system. Fund of \$43,000 has been arranged through Federal aid.

Southern Brewing Co., Zack and Pierce Streets, Tampa, Fla., has let general contract to C. E. Loud Engineering Co., St. Petersburg, Fla., for extensions and improvements in four-story building, recently acquired. New plant will have initial capacity of 100,000 bbl. a year. E. A. Siebel & Co., 8 South Dearborn Street, Chicago, are consulting engineers, and will be in charge of equipment purchases.

◀ SOUTH CENTRAL ▶

Kentucky Products Co., Louisville, distiller, has plans for two new plants, each with power house, machine shop and other departments, at Hobbs and Greenbrier, Ky., respectively. Each will cost over \$100,000 with equipment. D. X. Murphy & Brother, Louisville, are architects for Hobbs plant, and C. Walter Wagner, Louisville, architect for Greenbrier distillery.

Grapevine Coal Co., Madisonville, Ky., plans rebuilding part of operating plant, including mechanical units with forge and blacksmith shop, recently destroyed by fire. Loss about \$40,000 with equipment.

C. P. Moorman & Co., Inc., Louisville, recently reorganized with capital of \$300,000, plans extensions and improvements in distillery, including additional equipment. Cost over \$85,000 with machinery.

Louisville Stave & Timber Co., Sequatchie, Tenn., plans new branch mill at Chattanooga, Tenn., for production of wire-bound kegs, barrels, etc. Cost over \$35,000 with machinery. Company has recently increased capital to \$250,000 for expansion.

Wind Rock Coal Co., Oliver Springs, Tenn., plans rebuilding machine shop, forge and blacksmith shop, and tool house, recently destroyed by fire. Loss about \$25,000 with equipment.

◀ WASHINGTON DISTRICT ▶

Krebs Pigment & Color Corp., 2001 Benhill Avenue, Baltimore, will soon ask bids on general contract for one-story ore-grinding department, 45 x 68 ft. A new three-story unit, 40 x 100 ft., will also be erected. Entire project will cost about \$50,000 with equipment. Company is a subsidiary of E. I. duPont de Nemours & Co., Wilmington, Del.

Bureau of Yards and Docks, Navy Department, Washington, asks bids (no closing date stated) for electric distributing system (Specification 7441), and for turbo-exciter, motor and switchboard (Specification 7576) for Naval Academy, Annapolis, Md.

Consolidated Gas, Electric Light & Power Co., Lexington Building, Baltimore, has plans

A HANDFUL OF "DETAILS" THAT CAN MAKE OR BREAK A PRODUCT



Do you always "touch bottom" when you specify the KIND of screw machine stock?

A product, even though splendidly engineered in the main, can harbor "head-aches" enough in its minor details to make it impossible to keep its users happy. Screw machine parts are often among these "details."

An adjustment screw "frozen" by corrosion can so hamper the working of a machine as to make its operation more troublesome than beneficial. Close fitting sleeves or plates set to slide smoothly under ordinary conditions can fail to function entirely if suddenly subjected to exceptional temperature rise. Fittings that throw off sparks when struck can become a fire hazard near gases or volatile liquids. And unsuitable minor bearings that exact too frequent renewal sooner or later prejudice the entire mechanism.

Because of its unusual characteristics, Seymour Phosphor Bronze screw machine stock comes into its own under just such trying conditions. It resists corrosion and friction remarkably, is but slightly affected by thermal change, emits no spark when struck, and does not "arc."

In spring service, Seymour Phosphor Bronze is ideal because of its high resilience, stubborn resistance to fatigue, and willingness to take sharp bends without annealing.

By no means, however, do we offer Seymour Phosphor Bronze as a sovereign cure-all for the ills of product design. Nevertheless, "details make perfection," and perfection is a good mark to shoot at! May we help you in any way?



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ALSO: NICKEL SILVER SHEETS, WIRE, RODS : AND NICKEL ANODES

for one-story machine shop at plant at Race Street and Baltimore & Ohio Railroad. New steel oil tank, 115 ft. diameter, will also be built. Entire project will cost over \$50,000.

Rapidan Gold Corp., P. O. Box 252, Fredericksburg, Va., has begun erection of one-story concentrating mill at gold-mining properties at Wilderness, Va., and will install flotation equipment, agitators, air compressors, pumping and other machinery. Cost about \$35,000.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until March 6 for iron or steel wire cloth, copper wire cloth and bronze wire cloth (Schedule 1798) for Eastern and Western navy yards; one motor-driven metal-cutting machine (Schedule 1803) for Brooklyn yard.

◀ WESTERN PENNA. ▶

MacQuown River Transportation Co., Inc., affiliated with MacQuown Fuel Co., Union Trust Building, Pittsburgh, plans erection of number of coal tipples on Monongahela River,

between Morgantown and Fairmont, W. Va. Company also plans rebuilding coal tipple at Kingmont mine, Tygarts River, W. Va. Cost over \$85,000 with elevating, conveying, loading and other equipment.

Victor Brewing Co., Jeannette, Pa., will take bids early in spring on three-story and basement addition, 65 x 75 ft., for storage and distribution. Cost about \$45,000 with equipment. R. J. Broucker, Coulter Building, Greensburg, Pa., is architect.

Wheeling Sanitary Board, Wheeling, W. Va., plans pumping plants, disposal works, tank units, pipe lines, etc., for new Wheeling Creek Valley sewerage project, for which fund of \$1,000,000 is being arranged. Engstrom & Wynn, Inc., Wheeling, is consulting engineer.

Board of Allegheny County Commissioners, County Building, Pittsburgh, plans extensions and improvements in mechanical and power department at institutional buildings at Woodville, Pa., including refrigerating and cold storage units, equipment storage and repair building, and power house. Cost \$103,000 with equipment. J. L. Hopp, 508 Third Avenue, Pittsburgh, is engineer.

◀ MICHIGAN DISTRICT ▶

City Council, Flint, Mich., plans expansion and improvements at municipal airport, including new hangar, 90 x 120 ft., with reconditioning and repair shop, and other field units. Cost about \$125,000 with equipment. Federal financing has been arranged.

Dearborn Stamping Co., 10501 Haggerty Avenue, Dearborn, Mich., has been organized by Stanley G. Lewis, 13634 Wark Avenue, Detroit, and associates, to manufacture steel stampings and kindred products.

Auto City Brewing Co., Hamtramck, Mich., has begun expansion program, including new brew-house, storage and distribution unit. Cost about \$150,000, of which approximately \$90,000 will be expended for equipment.

DeVlieg Engineering Co., Jackson, Mich., has been organized by Charles B. DeVlieg, 120 West Michigan Avenue, and associates, to manufacture machine tools and parts.

◀ SOUTHWEST ▶

M. K. Goetz Brewing Co., Sixth and Alhambra Streets, St. Joseph, Mo., has plans for one-story and basement addition, 75 x 120 ft., for storage and distribution, including cold storage division. Cost about \$30,000 with equipment. Everett Johns, 1102 Corby Street, is architect.

Common Council, Pattonsburg, Mo., has been authorized to arrange bond issue of \$50,000 of total fund of \$67,400 for new municipal electric light and power plant. Federal financing is being arranged. E. T. Archer & Co., New England Building, Kansas City, Mo., are consulting engineers.

United States Engineer Office, Missouri River Division, Postal Telegraph Building, Kansas City, Mo., asks bids until March 12 for two electric power substations and equipment for 154,000-volt service for Fort Peck dam project. Missouri River, near Glasgow, Mont. (postponed from March 1); until March 7 for 154,000-volt power transmission line from Rainbow power plant of Montana Power Co., to Fort Peck dam site.

Board of Education, Fort Scott, Kan., plans manual training department in new two-story and basement school. Cost about \$190,000. Glen H. Thomas, 125½ North Topeka Street, Wichita, Kan., is architect.

City Council, California, Mo., plans installation of three Diesel engine-generating units, with accessory equipment, oil storage tank, cooling system, etc., in new municipal electric light and power plant. Fund of \$135,000 is available. W. B. Rollins & Co., Railway Exchange Building, Kansas City, Mo., are consulting engineers.

Water Department, Dallas, Tex., John B. Winder, superintendent, will soon take bids for equipment for extensions and improvements in water supply system in Oak Cliff and Trinity Heights districts, including elevated steel tank and tower, pumping machinery and accessories, pipe lines, etc. Fund of \$208,000 has been arranged for work.

◀ MIDDLE WEST ▶

Rock River Distillery, Inc., Dixon, Ill., is planning extensions and improvements. Cost about \$140,000, of which close to \$100,000 will be expended for machinery and other equipment. W. J. Howard is company engineer.

Commonwealth Division of General Steel Castings Corp., Granite City, Ill., has work under way on rehabilitation and improvements in local plant, closed since September, 1931. It is planned to reopen late in March, giving employment to about 1000 men.

Knisely Sheet Metal Co., Inc., 555 West Monroe Street, Chicago, has been organized by J. Raymond Tottenhoff and associates, to manufacture sheet metal products for building service.

City Council, Corning, Iowa, asks bids until March 12 for equipment for new municipal electric light and power plant, including three Diesel engine-generating units and auxiliary equipment, oil tanks, terminal tower, cooling pond equipment, etc.; also for electric distributing system. Fund of \$160,000 has been secured through Federal aid. Young & Stanley, Inc., Muscatine, Iowa, is consulting engineer.

Village Council, Litchfield, Minn., asks bids until March 5 for new electric generating machinery and auxiliary equipment for municipal electric light and power plant. Charles Foster, Sellwood Building, Duluth, Minn., is consulting engineer.



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NATIONAL Scale Free Pipe looks different—you instinctively prefer it; and the apparent advantage is a real one. Here are the reasons:

1. Minimized corrosion—particularly pitting. Mill-scale is one of the principal causes of pitting; therefore, when scale is removed, longer life is obtained from the pipe.
2. Clean, smooth surfaces, inside and outside—forming a better base for platings, galvanizing, or other protective coatings.
3. Full delivery capacity—less friction loss, because there are no obstructions to the flow.
4. No damage to valve seats; no clogging of small orifices—because there is no scale in the pipe to break off.
5. Greater strength at the weld. The additional rolling this pipe receives in the Scale Free Process increases the strength at the weld approximately 20 per cent, making the pipe particularly desirable for bending and coiling.

When ordering scale free pipe, specify NATIONAL—
The Original Scale Free Pipe
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All National Galvanized Pipe is given a special chromate treatment to resist discoloration and the formation of white rust. This patented process preserves that smooth glistening surface or metallic lustre which is characteristic of good galvanizing.

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NATIONAL
is the
ORIGINAL
SCALE FREE
PIPE

NATIONAL SCALE FREE PIPE
SPELLERIZED

Improved Alloy Carburizing Container

(Continued from Page 19)

with covers of the shoe-box type, and they are generally subject to considerable warpage along the flat unsupported sides. In these boxes, work is usually packed with from 1 to 2 in. of carburizing compound between it and the container wall, and the boxes are made as large as convenient handling permits.

At the plant of the Timken-Detroit Axle Co. it was realized that long pieces packed horizontally in the car-

burizing box tend to show considerable distortion during quenching. This distortion is caused by the slight variation in case depth from the top to the bottom of the piece in the box, and also by the tendency of the piece to bend when lifted horizontally from the box in quenching.

In trying to evolve containers which would permit of vertical packing, a design was developed whereby each piece was packed in an individual

cylindrical container which was just large enough in diameter to permit the work to be inserted. The accompanying illustration clearly shows this design. The experimental results immediately indicated that not only would the work come from this type of container freer from distortion, but it acquired the specified case depth in a remarkably short time.

Additional steps were immediately taken to develop the design to the point where all work suitable to this type of packing could be handled in this type of container, and this work included not only such parts as drive pinions, worms, pins, etc., but also included small gears and other objects which could be stacked vertically. It was soon discovered that the old values of minimum work to compound ratio and the distance between the work and the container had to be materially revised. Work was packed in 4, 6 and 8-in. containers which came within $\frac{1}{4}$ in. of the container wall, with excellent results. Work was also packed in these containers so that barely 10 per cent by volume of the container was available for compound, likewise with excellent results.

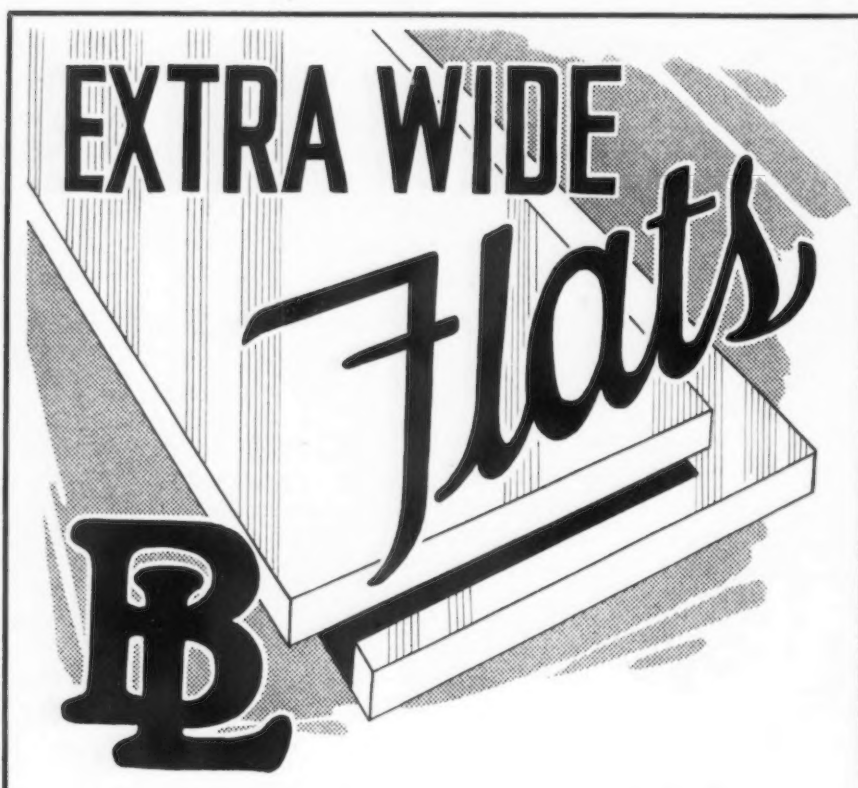
Greater Speed of the Reaction

In comparing the speed of the carburizing reaction in these containers, it was found that a container consisting of eight 5-in. cylinders would produce a case 0.050 in. in depth in $4\frac{1}{2}$ hr. total furnace time. A case of 0.030 to 0.040 in. under the same conditions could be obtained in 3 hr. total furnace time. This time compared favorably with any other known method of obtaining equivalent case depth. It was also found that another important advantage was obtained by this type of carburizing container in that it greatly facilitated the direct quenching of those parts which were quenched from the carburizing container.

The use of such steels which permitted direct quenching without increased distortion or grain growth has increased very rapidly during the past two years, so that the problem of best handling work which must be quenched directly from the carburizing container has become extremely important. The use of the individual cylinders with their separate covers permitted the quenching of the work from each individual container without disturbing the others, and hence there was very little variation in temperature between the first and last container emptied.

Insulating shields are usually provided to permit the hot containers to

(Concluded on page 78)



The B & L Extra Wide Flats are cold drawn in width up to 12", and in thickness up to 2". By reason of their accuracy to size and section, uniform flatness and straightness, they are becoming very popular for Industrial Applications such as—Backing Plates for Dies, Stripper Plates, Bed Plates, Jigs and Fixtures, Pattern Plates, and equipment parts.

The standard widths are 8", 10" and 12", with thickness $\frac{1}{4}$ " to 2". Intermediate widths can be furnished when desired. All of these extra wide flats are sawed to length and on no occasion sheared. They are manufactured to a size Tolerance of plus .000 minus .008" in all cases.

Surveys conducted in many Industrial Plants have definitely shown that there is a real saving through the use of these extra wide flats. On your next order involving any of the above mentioned or like applications, we invite your attention to the B & L product.

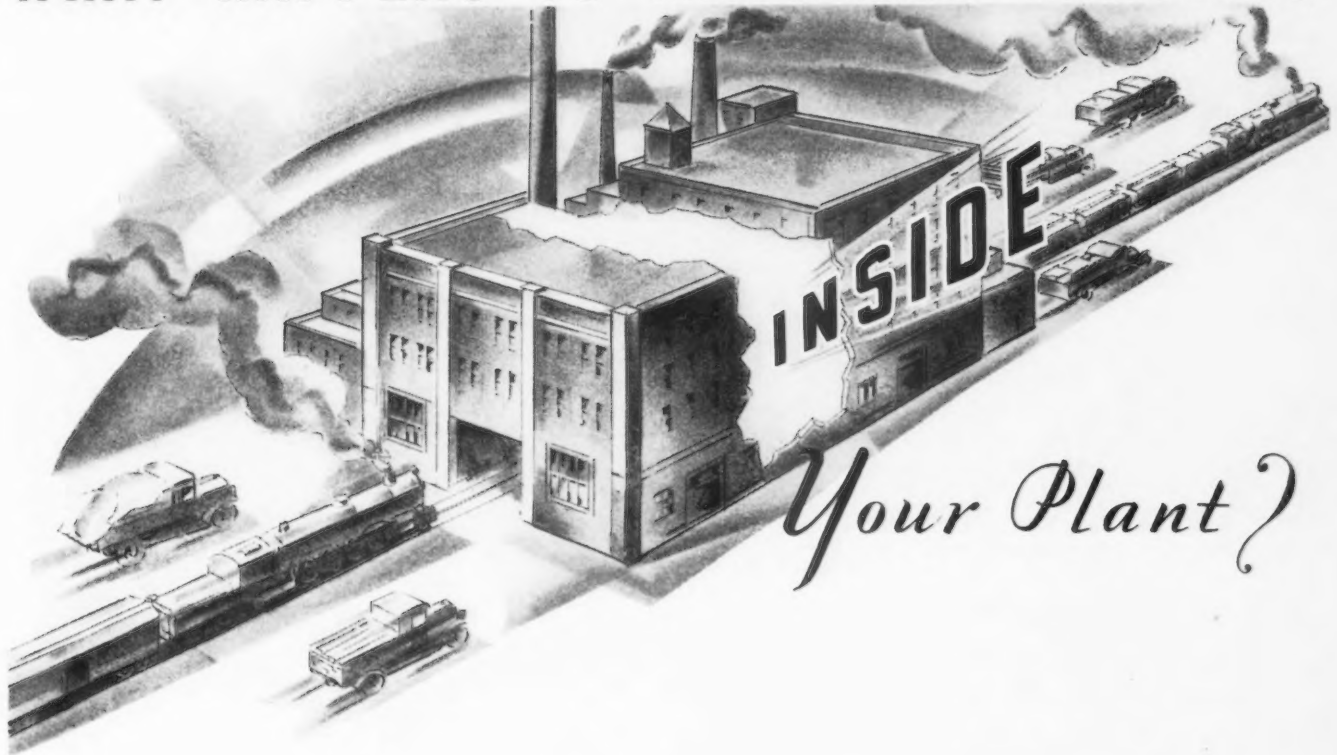
Bliss & Laughlin, Inc.

Harvey, Ill.

Buffalo, N. Y.

Sales Offices in all principal cities

WHAT HAPPENS TO MATERIALS HANDLING



Your Plant?

YOUR traffic department strives constantly to control costs of transporting materials TO and FROM your plant. Furthermore, a continuous effort is made to improve transportation service.

But what happens to materials handling INSIDE your plant?

Numerous opportunities for reducing costs to increase profits may await your discovery. Now is the time to CHECK UP. Osborn Tramrail engineers are ready to cooperate.

If you are now using overhead materials handling equipment, there may be ways

of securing greater coordination by the use of various units in the complete line of Osborn Tramrail Systems.

If you are not using any form of overhead materials handling equipment, a combination of units can be selected to assemble a complete Osborn Tramrail System especially suited to your requirements.

Osborn Tramrail Systems comprise many exclusive and patented features that merit serious consideration. Place your materials handling problems before an organization qualified with the right equipment and experience to assist you in the right solutions.

THE OSBORN MANUFACTURING COMPANY
5401 HAMILTON AVENUE, CLEVELAND, OHIO, U.S.A.



Before you invest in materials handling equipment, investigate Osborn Tramrail Systems

RAIL—TEERAIL & BEAMRAIL
RAIL FITTINGS—ALL TYPES
SUPPORTS—ALL TYPES
SWITCHES—SLIDING TYPE
TROLLEYS—HAND & ELECTRIC

OSBORN
TRAMRAIL SYSTEMS

HOISTS—CHAIN & ELECTRIC
CRANES—HAND & ELECTRIC
SPECIAL SECTIONS
ACCESSORY EQUIPMENT
ENGINEERING SERVICE

(Continued from page 76)

be comfortably handled, so that the whole operation of direct quenching is materially improved.

By means of certain fixtures it became possible to handle several pieces at the same time, so that this type of container was not limited to work of special design but had great advantages for all varieties of work, especially work of smaller size. The containers were found to be admirably suited to the handling of differential pinions, worms, small gears of all designs, pins, etc.

In the development of the container described above, one of the most important problems was to develop the fabricating of the containers to the point where a life was obtained which was economically comparable with the usual cast alloy. As a result of extended experience with sheet metal alloy, Resistal No. 4 was finally selected. This analysis of this alloy is approximately nickel 25, chromium 18, and silicon 2.5 per cent. This material has repeatedly demonstrated its superiority over the more usual nickel-chromium heat-resisting alloys used in carburizing containers, according to Mr. McQuaid. Considerable skill is required in welding this material, and the Pressed Steel Car Co. located at Wilkes-Barre, Pa., which has pioneered in the development of welded sheet alloy containers, has been able to very successfully produce the type of containers herein described.

The use of this individual type carburizing container, with the minimum amount of compound and the maximum amount of exposed heating surface, has indicated that solid carburizers have approximately the same rate of penetration as any of the commonly used carburizing gases. The limitation of the solid carburizer due to its relative slowness was found to be caused entirely by the insulating effect of the carburizing compound and the time required to heat the container itself.

The value of uniform heating, which is obtained in heating cylindrical objects and cylindrical containers, is of value in those parts where warpage is undesirable. In some parts it has been found possible to finish grind before carburizing, and by using a case which does not have to have additional thickness for grinding, to reduce warpage to within the finish grinding limits. This, of course, requires an alloy steel which has been especially developed to reduce the uneven quenching tendency. This type of steel can be obtained from any of the leading producers of alloy steels.

Steel Making as Temperature Raising

(Concluded from Page 15)

ing has been reached. Therefore the Bessemer requires practically a charge entirely of pig iron.

In the open hearth process the oxidation rate is considerably less and the total oxidizing effect of the open hearth process, even though extended over a much greater length of time than the Bessemer, requires only about half the protection that is required by the metal in the Bessemer, hence 50 per cent iron and 50 per cent scrap.

In the electric furnace process, where fuel is electric energy, which is neutral, the oxidizing effect comes only from the infiltration of air through doors or other furnace openings. This compared with open hearth or Bessemer is extremely slight, so slight in fact that it is frequently ignored and no protection whatever is afforded the metal. For this reason the electric furnace generally is 100 per cent steel scrap.

It so happens in the open hearth and Bessemer processes that arriving at the proper pouring temperature taxes the heating facilities, but in an electric furnace this is not so, so that in the latter pouring temperatures may be easily reached without the knowledge that sufficient protection against oxidation has not been afforded.

De-oxidation, which is the final stage of steel making and is intended to overcome the effect of over-oxidation, is an unsatisfactory proceeding and to minimize the necessity for it is desirable. Much in the way of quality therefore depends upon adequate protection from over-oxidation during the time interval required for arriving at the pouring temperature.

Italy's Aluminum Industry Growing

ITALY'S aluminum industry has made noteworthy progress in recent years, according to a report from Vice Consul Paul D. Thompson, Milan, made public by the Commerce Department.

While the country's copper resources have declined to a low point, aluminum ores have been developed and production has rapidly increased since 1926. The 1932 output registered an increase of 20 per cent over 1931 and more than 70 per cent over 1930.

At the close of 1932, Italy had attained sixth place among the world's aluminum-producing nations, the coun-

tries which outranked her being in the order of their importance, United States, Germany, Canada, Norway and France. Progress in the Italian industry has been favored by extensive and low-priced hydroelectric power, which is essential to the success of an industry in which electrolysis and other uses of electricity play such an important part.

No Tariff Revision On Chinese Antimony

WASHINGTON, Feb. 23. — The NRA will not make imports of Chinese antimony the subject for tariff revision. Complaint made against imports of this metal was made by the Texas Mining & Smelting Co., Laredo, Tex. It was charged they are rendering ineffective or seriously endangering the PRA under which the company is operating. General Hugh S. Johnson, National Recovery Administrator, in dismissing the complaint with the approval of President Roosevelt, said that an examination of the complaint does not warrant further investigation.

Ceramic Society Visits Armco and Frigidaire

MEMBERS of the American Ceramic Society which held its annual convention in Cincinnati the week of Feb. 11 were invited to visit the plant of the American Rolling Mill Co. and the Frigidaire Corp. on Feb. 15. Approximately 110 members of the society made the trip, most of whom were members of the enamel division.

At Armco, the guests were greeted by president Charles R. Hook, vice-presidents W. W. Sebal, Bennett Chapple, and Anson Hayes. They were conducted through the Armco laboratories and plants. The party then continued on to Dayton where they inspected the Frigidaire plant.

F. A. Tobitt, manager of Armco's enameling sales department, was chairman of the arrangements committee. He was assisted by Hugh Wright of Armco and W. H. Pfeifer and Glen Hutt of Frigidaire.

Foundry Equipment Manufacturers Association reports that January bookings of members shown by index figures were 37.2, as compared with 43.8 in December. Shipments were 33.4 as against 38.2 in the previous month and unfilled orders were 33.8 as against 35.2 in December.

5% TO 102% INCREASE IN PRODUCTION *with*

102.2%
PRODUCTION
INCREASE
1/2" Round, Cold Drawn
J & L Improved
Special High Sulphur
Bessemer Screw Steel



57.1%
PRODUCTION
INCREASE
3/16" Round, Cold Drawn
J & L Improved
Special High Sulphur
Bessemer Screw Steel



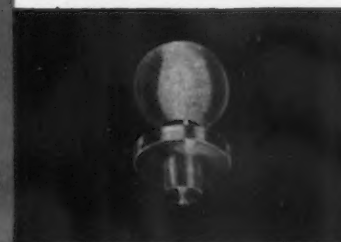
38.5%
PRODUCTION
INCREASE
1 1/16" Round, Cold
Drawn J & L Improved
Special High Sulphur
Bessemer Screw Steel



5%
PRODUCTION
INCREASE
1/4" Round, Cold Drawn
J & L Improved
S.A.E. 1112



5%
PRODUCTION
INCREASE
3/4" Round, Cold Drawn
J & L Improved
S.A.E. 1112



J & L *Improved* BESSEMER SCREW STEEL

NO CHANGE IN CHEMISTRY
OR PHYSICAL PROPERTIES



20%
PRODUCTION
INCREASE
3/4" Round, Cold Drawn
J & L Improved
S.A.E. 1112



18%
PRODUCTION
INCREASE
3/4" Round, Cold Drawn
J & L Improved
S.A.E. 1112

THE radical improvement in the machining quality of J & L Improved Bessemer Screw Steel is reflected in the production increases secured in making the parts shown. In addition, improved appearance was obtained. These are but a few of the many cases reported to us. This improved machinability is found in both S.A.E. 1112 and J & L Special High Sulphur Bessemer Screw Steel, in hot rolled bars, cold finished bars, and drawn wire. Write for descriptive bulletin.

**J & L
STEEL**

JONES & LAUGHLIN STEEL CORPORATION

AMERICAN IRON AND STEEL WORKS

JONES & LAUGHLIN BUILDING, PITTSBURGH, PENNSYLVANIA

Sales Offices: Atlanta Boston Buffalo Chicago Cincinnati Cleveland Dallas Denver Detroit Erie Los Angeles
Memphis Milwaukee Minneapolis New Orleans New York Philadelphia Pittsburgh St. Louis San Francisco

Warehouses: CHICAGO CINCINNATI DETROIT MEMPHIS NEW ORLEANS PITTSBURGH

Canadian Representatives: JONES & LAUGHLIN STEEL PRODUCTS COMPANY, Pittsburgh, Pa., U. S. A., and Toronto, Ont., Canada

FINANCIAL NOTES

Republic Steel Corpn. reports a net loss for 1933 of \$4,049,253 after all charges including \$3,181,038 in interest and \$7,610,502 for depreciation and depletion. This compares with a net loss of \$11,261,194 in 1932, \$9,034,112 in 1931 and \$3,522,003 in 1930. Net loss for the fourth quarter of 1933 was \$1,268,472 compared with a net profit of \$148,239 for the third quarter and a net loss of \$2,620,721 for the fourth quarter of 1932. (Only preliminary report has been issued.)

Lamson & Sessions Co., Cleveland, reports a profit of \$40,555 in 1933 as compared with a loss of \$681,340 in 1932. The net profit is after allowing \$212,542 for depreciation and \$75,600 for interest and other charges. Sales in 1933 were 58 per cent greater than in the preceding year.

American Steel Foundries reports \$1,400,640 preliminary consolidated net loss for 1933. This compares with \$1,526,244 net loss in 1932. Directors of the company have voted 50c. a share on the outstanding preferred stock. This dividend is the same as paid the previous quarter.

National Bearing Metals Corpn., St. Louis, reports net earnings of \$372,031 for 1933, compared with a loss of \$162,301 in 1932. Current assets are \$2,589,653 and current liabilities \$385,989, the former including \$494,609 in cash, \$493,359 in U. S. Treasury certificates; \$665,236 in accounts receivable and \$812,562 in inventories.

Beck & Corbitt Co., jobbers of iron and steel and automobile accessories, St. Louis, report a net loss of \$4,858 for 1933, compared with a loss of \$40,198 in 1932. Current assets of \$150,097 include \$103,395 in accounts receivable, \$1,853 in cash and \$41,227 in time certificates of deposit, and current liabilities total \$26,322.

Chicago Railway Equipment Co. reports \$115,936 consolidated net loss for 1933 compared with \$380,371 loss in 1932. The consolidated balance sheet shows \$2,095,005 current assets including \$109,415 cash and \$859,072 investment at cost which had a market value at the year end of \$755,296. Current liabilities were \$81,717.

Ohio Brass Co., Mansfield, Ohio, reports an operating profit of \$346,288 during 1933 and a net profit after depreciation of \$54,260 as compared with a loss of \$878,828 in 1932. The company has resumed payments of preferred dividends.

A. M. Castle Co., Chicago, merchandisers of iron and steel products operating in the Middle and Far Western States, reports that a net loss of \$46,568 incurred in the first six months of 1933 was more than made up in the second half of the year leaving a profit of \$102,824, equal to 86c. a share. In 1932 the company lost \$161,197. Current assets in 1933 set a ratio of \$13.11 to each \$1 of current liabilities.

Modine Manufacturing Co. shows for the year ended Dec. 31, 1933, net income of \$60,959 after all charges including depreciation, amortization, Federal and Wisconsin income taxes and loss on securities sold. These earnings are equal to 61c. a share on capital stock and compare with net loss of \$165,651 in 1932. The sales of the company in 1933 were 2½ times those of 1932.

Interlake Iron Corpn. and subsidiaries show consolidated net loss of \$817,731 for the year ended Dec. 31, 1933. This compares with net loss of \$2,169,887 in 1932. The balance sheet as of Dec. 31, 1933, reveals current assets of \$11,254,394, against current liabilities of \$1,599,725.

Sangamo Electric Co. reports \$63,655 consolidated net loss for 1933, compared with \$266,931 net loss in 1932. Net sales totaled \$2,071,719 against \$1,971,292. Total current assets are \$1,750,256, including \$227,912 cash and \$1,097,314 inventory. Total current liabilities are \$183,748.

International Harvester Co. has declared the regular quarterly dividend of 15c. a share on the common stock, payable April 16 to stockholders of record March 20.

TRADE PUBLICATIONS

Lubricated Plug Valves.—American Car & Foundry Co., 30 Church Street, New York. Bulletin illustrating completely lubricated plug valves for any line pressure; device is suitable as a substitute for globe and gate valves as mechanical means of regulating flow of fluids in pipe lines.

Circuit Breakers.—General Electric Co., Schenectady, N. Y. Folder describing new heavy duty oil blast circuit breaker designed for hardest types of motor starting and "jogging" operations. Apparatus features long life without maintenance, and is capable of handling potentials up to 15,000 volts and currents up to 1200 amperes.

Blast Cleaning Equipment.—Pangborn Corpn., Hagerstown, Md. Folder giving improvements in abrasive separators, safety helmets, blasting chambers, and steel abrasives.

Bronze Castings.—Superheater Co., East Chicago, Ind. Illustrated booklet showing complete line of bronze castings, rough or finished, in mixtures which include standard bronzes, aluminum bronzes, and super-tensile manganese bronze. Tables and physical data are included.

Roll Feeding Straightener.—Waterbury Farrel Foundry & Machine Co., Waterbury, Conn. Circular showing such applications as taking metal from a 200-lb. coil, flattening it and delivering it to a blanking press. The machine provides such economies as the saving of scrap by using coiled stock, lengthening the running time of the press, making the feeding to the press more accurate by removing drag on the delivery of the metal to the press and a saving in storage and operating space.

Link-Belt Co., Chicago and Philadelphia, has recently issued a new 64 page illustrated catalog and engineering data book, No. 1240. This book covers equipment for mechanical handling, screening, sizing, washing, dewatering, and preparation of sand, gravel, stone and other non-metallic minerals.

Collapsible Taps.—Landis Machine Co., tap division, Waynesboro, Pa. Two bulletins devoted to features and specifications of new collapsible taps. One, designated as the No. G-83, describes the style LT tool for straight tapping, and the other, the No. G-81, covers the style LM receding chaser collapsible tap for tapered work.

Die Heads.—Geometric Tool Co., New Haven, Conn. Eight-page booklet describing the company's recently-developed combination circular and tangent chaser die head. A chaser grinding fixture and micrometer setting gages are also shown, and principal specifications are given.

Driving Sheaves.—Allis-Chalmers Mfg. Co., Milwaukee. Illustrated folder giving engineering data and applications of Texteel sheaves and Texrope drives for all kinds of transmission problems.

Wooden Tanks.—Hauser-Stander Tank Co., Cincinnati, Ohio. Large illustrated book presenting installations and characteristics of industrial wooden tanks with various linings to withstand acids, oils, dyes, paints, etc.

TRADE NOTES

King & Andrews, Hanna Building, Cleveland, has been organized by John S. King and B. J. Andrews to handle sales of automotive hardware and mill supplies. Mr. King formerly was president of King & Wiley & Co., Inc., advertising agency and later was sales manager of the jobbing division of the Weatherhead Co., Cleveland. The organization plans to provide exclusive sales representatives in major distribution points to sell to jobbers. Service also will be provided on packaging, cataloging, discounts, distribution and sales promotion. The domestic sales force will be under the direction of Mr. King assisted by John T. McQuillan, formerly with Black & Decker, Towson, Md., and two field supervisors.

General Electric Co. will engage in the manufacture of gas burning furnaces to supplement its oil furnaces. These will be made in Cleveland in the plant formerly occupied by the B-Line Boiler Co., East 131st Street and Taft Avenue.

First Wisconsin Trust Co., Milwaukee, has been granted a foreclosure judgment in amount of \$229,266.67 against the Kempsmith Mfg. Co., Milwaukee, manufacturer of milling machines. A redemption period of one year was fixed by the court. Kempsmith company is in default on interest on a bond issue of \$200,000 and taxes since 1931.

R. B. Nichols, 1835 East Seventy-eighth Street, Chicago, has been appointed representative in the Chicago territory to cover industrial trades and automotive accounts for the Bantam Ball Bearing Co., South Bend, Ind. He has been handling the Southern Indiana and Southern Ohio territory. E. T. Cobb has been appointed to cover Tennessee, with headquarters at Pine Valley, Miss., handling industrial ball bearings and roller bearings.

Superior Screw & Bolt Mfg. Co., division Federal Screw Works, is operating a branch factory at 304 Jelliff Avenue, Newark, N. J., under management of J. W. Dawe. This branch will carry a complete stock of bolts, cap screws, U.S.S. and S.A.E. S.F. nuts and will represent the Superior company in the Newark territory in place of the Cap Screw & Nut Co.

Coburn Trolley Track Co. has been organized to succeed Coburn Trolley Track Mfg. Co., Holyoke, Mass. Leland C. Allen, formerly superintendent of old company, is president; Austin N. Kirkpatrick, treasurer, and Walter F. Zenner, secretary. Company will manufacture sliding door and fire door hardware, overhead conveying equipment, rolling ladders and overhead doors.

Hand Chain Hoists, Cranes, etc., Robbins & Myers, Inc., Springfield, Ohio. Bulletin 5151. Illustrates the more common types of chain hoists and compares values of three basic kinds. Advantages of ball and roller bearings in hoists are pointed out. Tables are included covering various hoist data and list prices.

Automatic Burner Corpn., manufacturers of ABC Oil Burners, announce that the Brown Supply Co., 2800 Pine St., St. Louis, distributors of Grunow refrigerators, Atwater Kent radios, and ABC Washing Machines, have taken on the distributorship of ABC oil burners for the eastern half of Missouri and the southern half of Illinois.

Carpenter Steel Co., Reading, Pa., has removed its New York sales office for welded alloy tubes, tool and stainless steels to the Equitable Trust Building, 347 Madison Avenue, New York.

Harrisburg Pipe & Pipe Bending Co., Harrisburg, Pa., has designated Day & Goater, 50 Church St., New York, as its authorized agent for reinforcing bars for the metropolitan district.

Call In The Armco Man



Wherever
SHEET METAL
Is
Fabricated

YOU WILL FIND
ARMCO AT WORK

YOUR industry, in fact every industry that uses sheet metal, has benefited by ARMCO'S introduction and improvement of special iron and steel sheets. From hot- and cold-rolled grades to finely-finished stainless steel alloys; from galvanized sheets to electrical sheets of exacting analyses, there is no conceivable grade that ARMCO cannot supply with greater economy and profit

for fabricators of sheet metal.

Doesn't this suggest that out of our 34-year metallurgical experience we can help you cut

production costs, improve your product and make it yield you more primes, bigger income? We should like to try. Write to us.

THE AMERICAN ROLLING MILL COMPANY

Executive Offices: Middletown, Ohio



ARMCO

means **GOOD IRON AND STEEL**

JUST BETWEEN US TWO

Hi Yuh, Vincel

NOT since we were proposed for membership in the National Geographic Society have we been so thrilled as we were last week when we received a personal invitation from Vincent Astor to subscribe for his paper, "Today."

We call that real nice of Vince and would take him up in a minute were it not for a faint suspicion that when our subscription came in he would like as not be out playing polo or something and it would miss his eye and we would miss our chance of getting in thick with the four hundred.

Our Back Is Getting Calloused

SEEMS like our morning's mail has never been loaded with so many back-pats as it is at present. Bear with us:

"The writer's opinion of The Iron Age is that as a magazine for the field which it covers, it is unequaled and the information it contains in connection with markets, the editorials and articles pertaining to machine design and production are very helpful."—*From a manufacturer of metal hose.*

"Your articles contained within the regular issues are very much appreciated, particularly on metal alloys, which we find very edifying and instructive."—*From a pump manufacturer.*

A Few Ages Too Early

MAYBE Herr Dr. Freud can tell us what made that Chicago gentleman, who sent in a Situation Wanted ad properly addressed to The Iron Age, make the check out to "The Stone Age."

We have often wondered if old Dave Williams who started this revered family journal back in 1855 was the first to pin the name "Age" on a periodical. If he earned honor, indeed he started something. The "Ages" must run into the hundreds. We always thought "Cab Age" would be a swell name for a taxi paper, and "Garb Age" for a clothing journal, but so far there are no takers.

A Little More Plot, Please, Mr. Dun

OUR journey through Mr. Dun's four-point tome as a means of bringing our lists up to date is slow and painful. We are about fed up on "fill sta," "gro," and "rest," in which these United States seem to abound. Maybe in some other publishing office a dull, tired eye gleams when it encounters "fill sta," "gro" or "rest," but the dull film on ours merely thickens.

Why not leave 'em out of future editions, Mr. Dun, and sprinkle in a few more exciting listings like the one you have on page 2151, "Herman Schreck, Sr., Hamilton, Ohio, mfrs. burial vaults, groceries and meats, G3"?

Bundled Scrap

WHY are South Pole expeditions? . . . Will the increasing flow of black ink put back the starch that the depression took out of stuffed shirts? Gawd forbid. If so, give us back our old depression. Everyone was so nice. High hats and red ink don't go together.

Weekly Blurb

OUR motto is, "Count that week lost in which you can't find something to blurb about." The week's contribution: *Published statements for the second half of 1933 indicate that The Iron Age's circulation gain was proportionately greater than that of any other metal-working magazine.*

Weak, But Still Alive

WE thought our old compound friends, "consumer-acceptance," "consumer-resistance," and "consumer-consciousness" were dead. We hadn't seen 'em around for so long. But we ran across the last one just the other day in Barron's. Here it is, stark, staring and unashamed, ". . . but when it (advertising) is well maintained its effect on consumer-consciousness is permanent."

In other words, if the advertising is permanent the consumer-consciousness is permanent and if the advertising is dropped the erstwhile consumer becomes unconscious of the existence of the erstwhile advertiser.

Which is something for those optimists who expect 1929 full pages to produce 1934 orders to stick in their 6¼ Knoxes.

—A. H. D.

"SQROUND"— A "2 in 1" Mesh

"SQROUND" Mesh, as its name indicates, is a square-round mesh which incorporates the advantages of both types of openings.



1/4" SQUARE



1/4" SQROUND



1/4" ROUND

A glance at the illustration will tell the story:

—The distance between filets in the corners of "Sqround" Mesh being the same as the diameter of an equivalent round opening, "Sqround" mesh eliminates the oversize which goes through the diagonal dimensions of a square mesh.

—"Sqround" mesh gives accurate sizing with very little reduction in the open area of the screening surface.

Sqround Mesh is available in any size mesh required in flat plate or in Hendrick Double Corrugated Plate. May we quote you?

HENDRICK MFG. CO.

37 Dundaff Street Carbondale, Pa.
Baltimore Birmingham Boston
Cincinnati Cleveland Detroit Hazleton
New York Philadelphia Pittsburgh

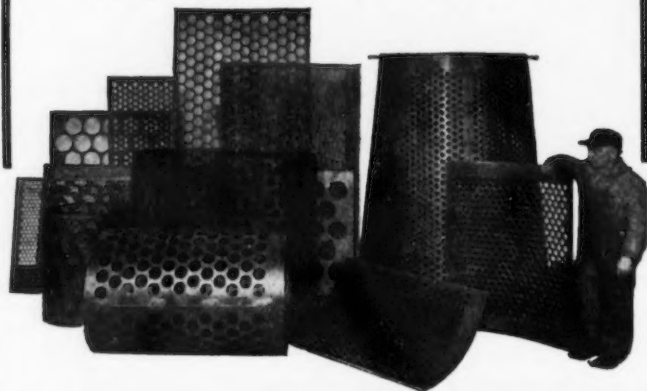
SCREENS of Perforated Metal

For a Thousand Uses

For Grain, Minerals, Chemicals or any other material to be screened

Ornamental Designs for Grilles, Cabinets, etc.

Any Metal—Any Perforation



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Harrington & King
PERFORATING CO.

5657 Fillmore St., Chicago, Ill. 117 Liberty St., New York, N.Y.